9TH AND MONROE STREETS, NE
TRANSPORTATION IMPACT STUDY
WASHINGTON, D.C.

Submitted on behalf of:
901 Monroe Street, LLC

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF FIGURES

LIST OF APPENDICES

Section 1
INTRODUCTION

OVERVIEW

The applicant, 901 Monroe Street, LLC, is proposing to rezone and redevelop 1.38 acres of land located in the Brookland neighborhood of Washington, DC. The subject site is located east of 9th Street, south of Monroe Street, west of 10th Street, and north of Lawrence Street in the northeast quadrant of Washington, D.C. From a transportation perspective, the site is situated ideally because of its close proximity to the Brookland-CUA Metro Station (across Monroe Street). The site location map is shown on Figure 1-1.

As proposed, the development would consist of 205 to 220 multi-family residential units with a neighborhood serving, ground-floor retail component (approximately 12,700 square feet (SF)). Vehicular access to the below-grade parking garage is proposed along 9th Street. Ingress for trucks will be provided via a driveway on 10th Street and egress for trucks will be provided via the driveway on 9th Street. The proposed site plan for the development is shown on Figure 1-2.

For the purposes of this study, construction of the development was assumed to be completed by 2020.

STUDY SCOPE

Overview

In order to assess the impacts of the proposed development on the surrounding roadway network, the Applicant commissioned this transportation impact study.

The scope of the study and proposed methodologies were discussed and agreed upon with the District Department of Transportation (DDOT) on August 11, 2009. This study has been revised based on comments from the DDOT dated October 17, 2011 and October 21, 2011.

Study Area

The study area was selected based on those intersections that potentially could be affected by the proposed redevelopment. The following intersections were selected for detailed analysis:

1. Michigan Avenue/Monroe Street
2. Monroe Street/9th Street/WMATA Driveway
3. Monroe Street/10th Street
4. 9th Street/Site Driveway

Study Objectives and Methodology

The objectives of this study were to: (1) evaluate existing transportation conditions, (2) evaluate future (2020) transportation conditions without and with the proposed redevelopment, (3) identify transportation impacts related to the proposed development, and (4) recommend improvements to offset those impacts.

Tasks undertaken in this study included the following:

1. Review of development plans provided by 901 Monroe Street, LLC.
2. Discussions with DDOT staff regarding the traffic study scope.
3. A field reconnaissance of existing roadway and intersection geometrics, traffic controls, and speed limits.
4. Turning movement counts at the study intersections during the AM and PM peak periods.
5. Analysis of existing and projected levels of service at the study intersections.
6. Estimation of the number of AM and PM peak hour trips that would be generated by the proposed development and the other planned developments in the area.
7. Recommendation of improvements required to mitigate the impact of the proposed development.

CONCLUSIONS AND RECOMMENDATIONS

1. The subject site is proposed to be rezoned from the C-1 and R-2 Districts to the C-2-B District to accommodate the construction of a 205 to 220 multi-family residential units with approximately 12,700 SF of retail.
2. The subject site is well-served by Metro and is located across Monroe Street from the Brookland-CUA Metro Station.
3. Under 2020 background conditions without the proposed redevelopment), the Monroe Street/10th Street intersection would operate at capacity.
4. Taking into account internal trips stemming from the synergistic relationship of the uses, the non-auto mode share, and pass-by trips to/from the retail uses, the proposed development would generate an estimated 83 AM peak hour vehicle trips and 99 PM peak hour vehicle trips.
5. At the off-site study intersections, the number of trips generated by the proposed redevelopment is expected to account for four percent or less of the total future traffic.
6. According to the parking requirements outlined in the District of Columbia Municipal Regulations (DCMR), 87 on-site parking spaces would be required for the proposed redevelopment. The proposed development plan would provide approximately 150 parking spaces.
7. According to the bicycle requirements outlined in the DCMR, five bicycle parking spaces would be required for the proposed redevelopment. The proposed development plan would provide approximately 60 to 80 bicycle parking spaces.
8. The existing pedestrian facilities, along with the sidewalk reconstruction and the bulb-outs proposed along the property's frontage, will adequately accommodate the anticipated pedestrian traffic from the proposed development.
9. The proposed redevelopment will not have a significant impact on the traffic operations in the study area.
10. The increase in traffic at the study intersections could be offset by the timing improvements at each of the signalized intersections.
11. A "Do Not Block Driveway" sign should be installed on 9th Street in advance of the proposed driveway to prevent vehicles from blocking the driveway.

Section 2
BACKGROUND INFORMATION

EXISTING LAND USE

The subject site is located in Ward 5, which is located in the northeast quadrant of the City. The site generally is bounded by Monroe Street on the north, Lawrence Street on the south, 10th Street on the east, and 9th Street on the west.

A portion of the 1.38-acre site currently is zoned C-1 (Neighborhood Shopping District) and a portion is zoned R-2 (Residence District).

The area surrounding the site is comprised of educational, institutional, retail, and residential uses. The Brookland-CUA Metro Station and the Brooks Mansion are located to the north of the subject site. Commercial and industrial uses are located to the west of the subject site. Residential uses are located to the south. Moore Academy Senior High School and residential uses are located to the east of the site.

BROOKLAND TRANSPORTATION AND STREETSCAPE STUDY

In the Spring of 2006, DDOT initiated a study that focused on comprehensive transportation and streetscape design to enhance safety and strengthen economic development and vitality of the Brookland community.

The goals and objectives of the study were as follows:[1]

- Enhance accessibility, connectivity, and efficiency of different modes of transportation.
- Reduce traffic congestion at key intersections.
- Reduce impact of truck traffic on residential neighborhoods.
- Lay the groundwork for future transportation investments.
- Reinforce a sense of place through creative urban and streetscape design.

The methodology for identifying transportation improvements took into account several key factors such as pedestrian safety, circulation and accessibility; accident history; traffic volumes and intersection levels of service; traffic control devices (i.e., traffic signals, signs, and pavement markings); and truck routes and regulations. The transportation improvements consisted of overall improvements, corridor improvements, and specific intersection improvements which were further divided into short- and long-term recommendations for further consideration by DDOT and the Brookland community.

A few of the overall improvements included:[2]

- Specific recommendations for WMATA to improve the overall mobility within the Brookland community including installation of directional signs at the Brookland-CUA metro station to guide transit riders to key destinations and area attractions; installation of new and expanded bike racks and bike lockers at the metro station; enhancement of pedestrian accessibility to the metro station; and replacement of existing bus shelters with shelters that include appropriate seating,
- Consideration of expanding the Zipcar/Flexcar program within the community to promote car-sharing,
- Installation of updated traffic signal timings with appropriate phasing adjustments to reflect current traffic conditions while improving traffic operations, and
- Installation of pavement markings along on-street parking spaces to better define parking areas and adjacent travel lanes.

Key features for achieving a potential reduction in travel speeds, enhanced pedestrian/bicycle safety, and additional parking along the Monroe Street corridor include bicycle lanes in each direction, provision for additional Zipcar/Flexcar parking spaces, and bulb-outs at the Monroe Street/9th Street intersection.

BROOKLAND-CUA METRO STATION SMALL AREA PLAN

In the Fall of 2006, the Office of Planning initiated a study of the neighborhoods surrounding the Brookland-CUA Metro station, as directed by the Comprehensive Plan. The goal of the study was "to create a redevelopment strategy for areas in and around the Metro station area that will serve as a framework to guide future development."[3] On March 3, 2009, the District of Columbia City Council approved the Brookland – CUA Metro Station Small Area Plan (the "Small Area Plan").

The Small Area Plan seeks to create a neighborhood civic core and arts infrastructure surrounded by transit-oriented mixed-use development. The Small Area Plan promotes improved overall neighborhood identity, connectivity and walkability, as well as new public spaces and green spaces.

The Small Area Plan divides the areas under review into four sub-areas. The subject property is located in the Monroe Street Sub-Area. The Small Area Plan notes that the "vision" behind the Monroe Street Sub-Area is to create "Monroe as [a] strong tree-lined urban street with retail, residential and cultural uses, connecting Brookland from east to west and becoming the opportunity for the creation of a Brookland Arts District."[4]

The Small Area Plan recommends that the Michigan Avenue/Monroe Street intersection, which currently creates a dangerous vehicular and pedestrian traffic situation, be reconfigured and reconstructed. The reconfiguration of the intersection would remove the current high speed right turn onto Monroe Street and would reduce the overall speed of traffic along Monroe Street. This reconfiguration also would allow for a significantly safer pedestrian experience in crossing Michigan Avenue. The reconfiguration of the Michigan Avenue/Monroe Street intersection is proposed to occur as part of the development of the approved Abdo Development/Catholic University South Campus PUD project.

ROADWAY NETWORK

Regional access to the site is provided via Michigan Avenue, Rhode Island Avenue, and North Capitol Street. Monroe Street, Lawrence Street, Kearney Street, 7th Street and 8th Street provide local vehicular access. A description of roadways in the immediate study area is provided below. The existing lane use and traffic control for each study intersection are shown on Figure 2-1.

Michigan Avenue is a four- to six-lane, undivided minor arterial with a posted speed limit of 25 miles per hour (mph) in the vicinity of the site.

The intersection of Michigan Avenue and Monroe Street is controlled by a traffic signal. In 2008, Michigan Avenue carried an average daily traffic volume of 36,700 vehicles per day (vpd) in the site vicinity.[5]

Monroe Street is a two- to four-lane minor arterial. In 2009, Monroe Street carried an average daily traffic volume of 14,900 vpd in the site vicinity.[6]

A couple of years ago, DDOT restriped Monroe Street to accommodate bike lanes on both sides of the street, as recommended in the Brookland Streetscape Study. In order to accommodate the bike lanes, only one travel lane in each direction is present east of 8th Street. West of 8th Street, one travel lane is present in the eastbound direction and two travel lanes are present in the westbound direction. On-street parking is permitted on the south side of Monroe Street.

9th Street is a two-lane collector roadway south of Monroe Street. North of Monroe Street, 9th Street serves as an access to the Brookland/CUA Metro Station for authorized vehicles only. The Monroe Street intersection is controlled by a traffic signal.

10th Street is a two-lane local roadway. The Monroe Street/10th Street intersection is controlled by a traffic signal.

METROPOLITAN BRANCH TRAIL

The Metropolitan Branch Trail (MBT) is an urban bicycle and pedestrian greenway linking Washington, D.C. with Maryland and a network of regional parks. The Metropolitan Branch Trail is an important recreation and transportation route and provides direct access to seven of Metro's Red Line stations.

The goals of the MBT Concept Plan for this area are summarized below:

- Provide a safe, continuous and visually coherent route through the semi-industrial neighborhood on 8th Street, NE and adjacent to the CUA campus along John McCormack Road;
- Provide strong connections to the Brookland neighborhood at Monroe Street and via the pedestrian underpass at the Brookland-CUA Metro Station;
- Improve access to and from the Brookland-CUA Metro Station; and
- Increase bicycle and pedestrian safety at arterial crossings by using existing and new grade separated facilities and improved at-grade crossings.[7]

Currently, in the site vicinity, the MBT is signed along 8th Street to Monroe Street then along 7th Street to the underpass for the Brookland-CUA Metro Station (i.e., Bunker Hill Road). The MBT then connects to John McCormack Road along the eastern side of the CUA campus.

DDOT's draft Metropolitan Branch Trail Concept Plan[8] outlines three different options for connecting the MBT along 8th Street to the Brookland-CUA Metro Station access (see Figure 2-2) and to the MBT along John McCormack Road. Each of the three options required a transition from the on-street 8th Street bikeway to an off-road bikeway. The Concept Plan showed that this transition could be provided (1) mid-block on 8th Street between Lawrence Street and Monroe Street; (2) on the west side of the Monroe Street/8th Street intersection; or (3) mid-block on Monroe Street between 7th and 8th Streets.

PEDESTRIAN ROUTES

Within the study area, sidewalks are present along both sides of Michigan Avenue, along both sides of Monroe Street, along both sides of 9th Street, and along both sides of 10th Street, north of Lawrence Street.

Pedestrian signals with marked crosswalks are located on all approaches at the Monroe Street/9th Street and Monroe Street/10th Street intersections.

As part of the proposed development, the sidewalks along the property frontage will be reconstructed. Additionally, at the request of DDOT, bulb-outs will be constructed at the following locations to provide a safer and more pedestrian-friendly environment:

- Southeast corner of the Monroe Street/9th Street intersection,
- Southwest corner of the Monroe Street/ 10th Street intersection,
- Northeast corner of the 9th Street/ Lawrence Street intersection,
- Northwest corner of the 10th Street/Lawrence Street intersection,
- Northwest corner of the Lawrence Street/ Alley intersection, and
- Southwest corner of the 10th Street/Driveway intersection.

The bulb-outs aid pedestrians by shortening the walking distance across the street and by functioning as traffic calming devices resulting in potentially reduced vehicle speeds.

PEDESTRIAN MASTER PLAN

The District of Columbia Pedestrian Master Plan strives to make Washington, D.C. safer and more walkable by improving sidewalks, roadway crossings, and the quality of the pedestrian environment as well as by ensuring that the District's policies and procedures support walking.[9] The plan provides an overview of existing pedestrian conditions, recommends new pedestrian projects and programs, establishes performance measures, and provides a plan for implementation through 2018.

The Plan estimates areas of pedestrian activity and deficiency. Within the site vicinity, Monroe Street contains low to moderate pedestrian activity and low to moderate pedestrian deficiency and 9th Street contains moderate pedestrian activity and moderate pedestrian deficiency as shown on Figure 2-3.

The Plan provides pedestrian crash data for the years 2000 through 2006. Within the site vicinity, one pedestrian crash has occurred at the Monroe Street/9th Street intersection. Two to four pedestrian crashes have occurred at the Michigan Avenue/Monroe Street and Monroe Street/10th Street intersections within the study period.

As part of the Plan, eight priority corridors (one in each ward) were identified based on areas of heavy pedestrian traffic and deficient walking conditions. The priority corridor in Ward 5 is Bladensburg Road, NE from Benning Road, NE to Eastern Avenue, NE and, therefore, is outside of the study area. No specific improvements to roadways in the study area were outlined in the plan.

BICYCLE MASTER PLAN

The District of Columbia Bicycle Master Plan[10] seeks to create a more bicycle-friendly city by establishing high quality bicycle facilities and programs that are safe and convenient.

As part of the plan, under the existing condition of bicyclists sharing the road, the bicycle levels of service (BLOS) in the site vicinity are shown in Table 2-1 and on Figure 2-4.

Table 2-1
Existing Bicycle Levels of Service

Roadway	Bicycle Level of Service
Michigan Avenue	D
Monroe Street	A/D*
9th Street	D
*LOS A west of 9th Street and LOS D east of 9th Street	

Additionally, the Plan reports the number of bicycle crashes that occurred between 2000 and 2002. No bicycle crashes occurred at any of the study intersections during the three-year period.[11]

CAPITAL BIKESHARE

Capital Bikeshare is an automated bicycle rental or bicycle sharing system in the Washington, D.C. area. The District and Arlington County have teamed up to launch a new bike share program that includes 110 stations with 1,100 bicycles.

There are three Bikeshare stations near the site, as shown on Figure 2-5;

- 11 bikes are located on Monroe Street between 9th Street and 10th Street,
- 10 bikes are located at the intersection of John McCormack Drive/Michigan Avenue, and
- 11 bikes are located at the intersection of 12th Street/Newton Street.

To utilize the bike sharing program, a membership must first be purchased. Membership in Capital Bikeshare cost $75 for an annual membership, $25 for a monthly membership, $15 for a three day membership, and $7 for a 24-hour membership. The first 30-minutes of use are free; users are then charged a usage fee for each additional 30-minute period.

ZIPCAR

Similar to SmartBike, Zipcar is an automated car rental or car sharing system in the Washington, D.C. area. Zipcar users must fill out an application online and then would receive a Zipcard, which enables them to reserve Zipcars at any of the locations. Users pay either an hourly or daily rental fee to utilize the car for their reserved time slot. Cars must be returned to the same designated parking space at which it was picked up.

Zipcars are located at four locations near the site, as shown on Figure 2-5;

- Three cars are located at the O'Boyle parking lot on the CUA Campus,
- Two cars are located at the McMahon parking on the CUA Campus,
- Two cars are located at the Brookland-CUA Metro Station, and
- One car is located at 650 Jackson Street near St. Paul's University.

PUBLIC TRANSPORTATION FACILITIES AND SERVICES

The subject site is well-served by Metro and is located within approximately one block of the Brookland-CUA Metro Station and approximately one mile from the Rhode Island Metro Station.

The Brookland-CUA Metro Station has 25 short-term metered parking spaces, 10 bicycle racks, and 16 lockers. Car sharing is available at this Metro Station.

In April 2010 the parking lot at the Rhode Island Metro Station containing 333 parking spaces and 40 short-term metered parking spaces was permanently closed, Currently, the Metro station contains 15 short term parking spaces and 12 bicycle racks. Car sharing is also available at this Metro Station.

The Red line provides service at both the Brookland-CUA Metro Station and the Rhode Island Metro Station.

The area also is served by several Metrobus routes. The Brookland-Potomac Park Line (Metrobus Route H1), the Crosstown Line (Metrobus Routes H2, H3, and H4), the Park Road-Brookland Line (Metrobus Routes H8 and H9), the North Capitol Street Line (Metrobus Route 80), and the Rhode Island Avenue Line (Metrobus Route G8) provide bus service in the study area, as described below.

The Brookland-Potomac Park Line (Metrobus Route H1) provides bus service in the area with a stop located at the intersection of Monroe Street/7th Street. The route provides service to the Brookland-CUA Metro Station, the Columbia Heights Metro Station, the Dupont Circle Metro Station, and the Foggy Bottom-GWU station.

The Crosstown Line (Metrobus Routes H2, H3, and H4) also provides bus service in the area with a stop located at the intersection of Monroe Street/7th Street.

Route H2 provides service to the Brookland-CUA Metro Station, the Columbia Heights Metro Station, the Cleveland Park Metro Station, and the Van Ness-UDC Metro Station. Routes H3 and H4 provide service to the Brookland-CUA Metro Station, the Columbia Heights Metro Station, the Cleveland Park Metro Station, and the Tenleytown-AU Metro Station.

The Park Road-Brookland Line (Metrobus Routes H8 and H9) provides bus service in the area with a stop located at the intersection of Monroe Street/10th Street. Route H8 provides service to the Columbia Heights Metro Station, the Georgia Avenue-Petworth Metro Station, the Brookland-CUA Metro Station, and the Rhode Island Avenue-Brentwood Metro Station. Route H9 provides service to the Brookland-CUA Metro Station, and the Rhode Island Avenue-Brentwood Metro Station.

The North Capitol Street Line (Metrobus Route 80) provides bus service in the area with a stop located at the intersection of Monroe Street/7th Street. Route 80 provides service to the Fort Totten Metro Station, the Brookland-CUA Metro Station, the Gallery Place-Chinatown Metro Station, the Metro Center Metro Station, the McPherson Square Metro Station, and the Farragut North and West Metro Stations.

The Rhode Island Avenue Line (Metrobus Route G8) also provides bus service in the immediate study area. Bus stops are located at the Monroe Street/7th Street and the Monroe Street/8th Street intersections. Route G8 provides service to the Brookland-CUA Metro Station, the Shaw-Howard University Metro Station, the Metro Center Metro Station, and the Farragut North and West Metro Stations.

Section 3
EXISTING CONDITIONS ANALYSIS

TRAFFIC VOLUMES

Turning movement counts were conducted at the following intersections on Thursday, November 15, 2011 from 7:00 AM to 10:00 AM and from 4:00 PM to 7:00 PM:

- Michigan Avenue/Monroe Street
- Monroe Street/9th Street/WMATA Driveway
- Monroe Street/10th Street

Based on the data collected, a common AM peak hour and a common PM peak hour were selected for these three intersections. The common AM peak hour occurred from 7:30 AM to 8:30 AM and the common PM peak hour occurred from 5:00 PM to 6:00 PM.

Raw traffic counts were adjusted slightly to balance between intersections where no driveways or intersections are present between intersections.

Peak hour baseline traffic volumes are summarized on Figure 3-1. Traffic count data are included in Appendix A.

OPERATIONAL ANALYSIS

Capacity/level of service (LOS) analyses were conducted based on the existing lane use and traffic control shown on Figure 2-1, existing vehicular traffic volumes shown on Figure 3-1, and existing DDOT traffic signal timings, which are included in Appendix B.

Synchro software (Version 8, Build 801 Revision 563) was used to evaluate levels of service at each of the study intersections during the AM and PM peak hours. Synchro is a macroscopic model used to evaluate the effects of changing intersection geometrics, traffic demands, traffic control, and/or traffic signal settings and to optimize traffic signal timings. The levels of service reported were taken from the Highway Capacity Manual 2000[12] (HCM) reports generated by Synchro. Levels of service descriptions are included in Appendix C.

The Synchro results are presented in Appendix D and summarized in Table 3-1. Based on the existing configuration and signal phasing of the Michigan Avenue/Monroe Street intersection, the intersection was analyzed as three sub-intersections linked by a single traffic signal controller. For purposes of discussion herein, the three sub-intersections are labeled as A, B, and C, as identified on Figure 2-1.

In accordance with DDOT's Design and Engineering Handbook,[13] a LOS "D" is considered to be the acceptable threshold in the District for overall intersection level of service. Degradation to an overall LOS "E" or "F" typically is considered unacceptable. In urban conditions, the amount of delay considered acceptable to drivers is higher than in typical suburban or rural conditions; therefore, a LOS "E" is considered acceptable in the District when looking at approach levels of service.

As shown in Table 3-1, all of the study intersections currently operate at acceptable levels of service.

Table 3-1
Existing Levels of Service

Approach	AM Peak	PM Peak
Michigan Avenue/Monroe Street (A)		
NBT	C (20.6)	E (56.4)
NBR	B (13.4)	C (23.6)
SBT	A (0.4)	A (0.2)
Overall	**A (5.6)**	**C (31.7)**
Michigan Avenue/Monroe Street (B)		
WBLR	B (16.7)	A(5.3)
NBT	A (1.9)	A (4.4)
SBT	C (24.4)	B (11.1)
Overall	**B (17.6)**	**A (6.4)**
Michigan Avenue/Monroe Street (C)		
EBT	A (9.5)	C (21.7)
WBR	C (22.4)	C (26.6)
Overall	**B (18.3)**	**C (23.5)**
Monroe Street/9th Street/WMATA Driveway		
EBL	A (1.9)	A (6.1)
EBTR	A (2.5)	C (22.2)
WBLTR	B (13.6)	A (6.9)
NBLTR	E (55.1)	C (34.1)
SBLTR	C (33.2)	D (35.9)
Overall	**B (14.6)**	**B (18.7)**
Monroe Street/10th Street		
EBLTR	A (7.2)	B (10.4)
WBLTR	C (23.2)	A (10.0)
NBLTR	C (30.5)	C (34.2)
SBLTR	E (59.2)	D (39.6)
Overall	**C (26.4)**	**B (16.3)**

[x.x] = unsignalized intersection control delay in sec/veh
(x.x) = signalized intersection control delay in sec/veh

Section 4
FUTURE BACKGROUND CONDITIONS

LAND USE

External Pipeline Developments

In addition to the proposed development, seven other developments are planned in and around the study area and were considered as part of the background traffic growth.

The Catholic University of America (CUA), in conjunction with Abdo Development, LLC received approval for a Planned Unit Development (PUD) and Zoning Map Amendment application to rezone and redevelop a portion of CUA's campus, known as ***CUA's South Campus***. The six blocks that comprise CUA's South Campus encompass 8.9 acres of land and generally are bounded by Michigan Avenue on the north, Kearney Street on the south, the WMATA/CSX tracks on the east, and the Dominican House of Studies and Theological College on the west. The mixed-use development will consist of 875,962 SF of rental residential, condominium residential, and townhouses (or 848 total units); 83,073 SF retail; and 17,907 SF arts space. The development is expected to be completed in 2015.

EYA received approval of a PUD application in November 2008 to develop approximately 10 acres of land on the 20-acre ***St. Paul's College*** campus, generally located east of 4th Street between Hamlin Street and Jackson Street, NE. As proposed, the development would consist of 237 townhouse units. Construction has begun and is expected to be complete by 2014 or 2015.

The ***Rhode Island Avenue Gateway*** development is proposed near the intersection of 4th Street and Rhode Island Avenue, NE. The proposed development will consist of a 170-unit residential building with 3,000 SF of ground floor retail. The development is in the planning stages.

The ***Armed Forces Retirement Home***, generally located in the northwest quadrant of the Irving Street/North Capitol Street intersection, NE, is proposing to lease nearly half of its 272-acre campus to private developers. The first phase of the project, which includes 950,000 SF of office space, 140,000 SF of retail space, a hotel and 77 transitional housing units is anticipated to be completed by 2012. The second phase does not have specific planned land uses but is anticipated to be completed in 2018.

The ***McMillan Sand Filtration Site*** is a 25-acre tract located at the intersection of North Capitol Street and Michigan Avenue, NE. The mixed-use development will consist of 100,000 SF of office space, 40,000 SF of conference space, a 200 room hotel, 100,000 SF of retail space, and an 8,000-SF restaurant. For purposes of this study, the multi-phased project is expected to be completed by 2020.

250 Michigan Avenue, located at the intersection of Michigan Avenue and Irving Street, NE, is a proposed development consisting of a 200 room hotel and 160,000 SF of office space, which also would include a health club and retail stores. The project is expected to be completed by 2015. [1]

Dance Place, located at 3225 8th Street NE, recently completed construction of a new performance hall, rehearsal spaces, studios, classrooms, and 30 to 40 affordable live/work units. As such, it was not included as a pipeline development.

In 2002 the Zoning Commission approved a ***Master Plan for the CUA Campus***, which is valid until May 22, 2012. As part of this current Master Plan, CUA would be permitted to increase their enrollment to 7,500 full time equivalent students. According to the CUA website there are 6,967 students[15] (estimated to be approximately 5,504 full time equivalent students) enrolled at the University;

[1] Subsequent to the completion of the traffic analyses contained in this study, the PUD application for 250 Michigan Avenue was approved for a 314 room hotel, a 30,000 SF conference center, 18,000 SF of retail space, and a 5,000 SF restaurant. The development program analyzed would generate 119 more vehicle trips during the AM peak hour and 26 more vehicle trips during the PM peak hour than the development program approved during the PUD process. As such, the analysis shown herein was considered conservative and, therefore, was not updated.

therefore, an additional 1,996 additional full time equivalent students could be enrolled at CUA under this plan. At the time of this study, the 2012 Master Plan had not been approved; therefore, for the purpose of this study, the enrollment thresholds in the 2002 Master Plan where used.

The location of each pipeline development is shown in Appendix E.

ROADWAY NETWORK

In conjunction with ***CUA's South Campus*** redevelopment plan, the Michigan Avenue/Monroe Street intersection is proposed to be realigned to provide a safer operation for future traffic conditions. The Michigan Avenue/Monroe Street intersection was analyzed as a standard "T" intersection with more conventional signal timing phasing. Specifically, the analysis for the Michigan Avenue/Monroe Street intersection was conducted as a two-phase signal operation, with a northbound right-turn overlap phase. The future lane use and traffic control is shown on Figure 4-1.

FUTURE BACKGROUND TRAFFIC FORECASTS

In order to account for regional traffic growth outside the immediate site vicinity, a two percent growth rate, compounded annually, was applied to the baseline traffic volumes. The resulting volumes are shown on Figure 4-2. Note that this growth rate, used at the request of DDOT, should be considered conservative since historical traffic volumes in the area indicate that growth in the area has occurred at the rate of one percent or less per year.

Additionally, traffic volumes from the various pipeline developments previously described were included in the future traffic forecasts. The number of trips that would be generated by these pipeline developments was estimated either based on the Institute of Transportation Engineers' (ITE) Trip Generation[16] or on previously completed traffic impact studies.

Site traffic associated with the ***CUA South Campus Redevelopment*** was taken from the TIS performed by Wells + Associates, Inc. submitted in September 2008. Therefore, the trip generation (as shown in Table 4-1) and the distribution and assignment for the CUA South Campus redevelopment were taken directly from that study.

The site trips were carried through the study intersections for this study as applicable. The peak hour site trips associated with the redevelopment are included in Appendix E.

A TIS performed by Wells + Associates, LLC was submitted in September 2007 for the ***St. Paul's College*** PUD application; however, because this study analyzed 260 townhouse units, rather than the 237 units now proposed, the trip generation was reevaluated for purposes of this study. Site traffic for the 237 townhouse units was generated based on ITE Land Use Code 230 (Residential Condominiums/ Townhouse) and the resulting trips are shown in Table 4-1. The 35 percent non-auto trip reduction utilized in the previous Wells' study was applied to the total trip generation, as shown in Table 4-1. The distribution and assignment of site trips for the townhouse units also was consistent with the previous Wells' TIS; however, the site trips were carried through the study intersections for this study as needed. The peak hour site trips associated with the St. Paul's College PUD application are included in Appendix E.

The ***Rhode Island Avenue Gateway*** development was included as a pipeline development in the Well's TIS for the St. Paul's College PUD application. Therefore, the trip generation (as shown in Table 4-1) and the distribution and assignment for the Rhode Island Avenue Gateway development were taken directly from that study.

The site trips were carried through the study intersections for this study as applicable. The peak hour site trips associated with the Rhode Island Avenue Gateway development are included in Appendix E.

A Final Environmental Impact Statement (FEIS) for the ***Armed Forces Retirement Home*** Master Plan was completed in November 2007 by the Armed Forces Retirement Home in cooperation with the National Capital Planning Commission. The trip generation (as shown in Table 4-1) and the

distribution and assignment were taken from the FEIS. There were no common study intersections between the FEIS and this study; therefore, the site trips from the FEIS were extrapolated through the study intersections as needed (see Appendix E). Appropriate documentation from the FEIS also is included in Appendix E.

Site traffic associated with the ***McMillan Sand Filtration Site*** development was generated based on various ITE land uses as detailed in Table 4-1. A non-auto trip reduction was not applied to the trip generation for this site because of its distance (over one mile) to a Metro station. The distribution of site trips for this site was assumed to be the same as the site trip distribution for the retail portion of the CUA site. The ensuing site trip assignment for the McMillan Sand Filtration Site is included in Appendix E.

The trip generation for the development located at ***250 Michigan Avenue*** was developed based on ITE Land Use Codes 710 (General Office) and 310 (Hotel), with a 15 percent non-auto trip reduction for the office component (as shown in Table 4-1). Similar to the McMillan Sand Filtration Site, the distribution of site trips for this site was assumed to be the same as the site trip distribution for the retail portion of the CUA South Campus site. The resulting site trip assignment for the 250 Michigan Avenue site is included in Appendix E.

The ***Catholic University of America Campus Master Plan Update*** - Traffic Impact Assessment was completed by O.R. George & Associates, Inc. in April 2002. This study estimated that an increase in enrollment to 7,500 (or an additional 3,143) full time equivalent students would result in an additional 483 AM peak hour trips and 582 PM peak hour trips. Based on enrollment numbers for the 2010 – 2011 school year, the number of students has increased to 6,967. Wells + Associates used historical enrollment numbers[17] to estimate that an enrollment of 6,976 students would be equivalent to approximately 5,504 full time equivalent students. Therefore, an additional 1,996 additional full time equivalent students would be permitted under the current Campus Plan. This increase would would result in an additional 299 AM trips and 379 PM trips, as shown in Table 4-1.[18]

The O.R. George study had several study intersections in common with this study; therefore, the site trip distributions were taken directly from the Master Plan study and extrapolated to the remaining study intersections as necessary. The resulting site trip assignment is included in Appendix E.

The traffic assignments associated with each of the pipeline developments are included in Appendix E. The combined peak hour site trips associated with the pipelines are shown on Figure 4-3.

The factored traffic volumes shown on Figure 4-2 were combined with the pipeline developments traffic assignments shown on Figure 4-3 to yield the 2020 future background traffic forecasts shown on Figure 4-4.

Table 4-1
Pipeline Development Trip Generation Summary

Development	Land Use/Trip Type	AM Peak Hour			PM Peak Hour			Weekday ADT
		In	*Out*	*Total*	*In*	*Out*	*Total*	
St. Paul's College	**Residential Condominium/Townhouse** (ITE Land Use Code 230) – 237 Dwelling Units							
	Total Site Trips	18	85	103	82	40	122	1,337
	Non-Auto Site Trips (35%)	*6*	*30*	*36*	*29*	*14*	*43*	*468*
	Vehicular Site Trips	**12**	**55**	**67**	**53**	**26**	**79**	**869**
Rhode Island Avenue Gateway	**Residential Condominium/Townhouse** (ITE Land Use Code 230) – 170 Dwelling Units							
	Total Site Trips	13	66	79	62	31	93	1,008
	Non-Auto Site Trips (35%)	*5*	*23*	*28*	*22*	*11*	*33*	*353*
	Vehicular Site Trips	8	43	51	40	20	60	655
	Specialty Retail Center* (ITE Land Use Code 814) -- 3,000 Square Feet							
	Vehicular Site Trips	5	6	11	13	16	29	133
	Total Rhode Island Avenue Gateway Development							
	Total Site Trips	18	72	90	75	47	122	1,141
	Non-Auto Site Trips	*5*	*23*	*28*	*22*	*11*	*33*	*353*
	Vehicular Site Trips	**13**	**49**	**62**	**53**	**36**	**89**	**788**
Armed Forces Retirement Home	**AFRH Master Plan**** Office – 950,00 Square Feet Retail – 140,000 Square Feet Hotel – 123,026 Square Feet Residential – 77 Dwelling Units							
	Vehicular Site Trips	**1,548**	**1,178**	**2,726**	**1,582**	**2,082**	**3,664**	**36,640**

* AM Peak hour rate based on the PM peak hour rate of the adjacent street divided by the PM peak hour rate of the generator multiplied by the AM peak hour rate of the generator.

** Obtained AM and PM peak hour trips from The Armed Forces Retirement Home Washington Master Plan Final Environmental Impact Statement prepared by Armed Forces Retirement Home, November 2007. The Weekday ADT was calculated by dividing the PM peak hour site trips by 10%.

Table 4-1 (continued)
Pipeline Development Trip Generation Summary

Development	Land Use/Trip Type	AM Peak Hour			PM Peak Hour			Weekday ADT
		In	*Out*	*Total*	*In*	*Out*	*Total*	
McMillan Sand Filtration Site	**General Office Building** (ITE Land Use Code 710) – 100,000 Square Feet							
	Vehicular Site Trips	165	23	188	32	159	191	1,334
	Hotel (ITE Land Use Code 310) – 200 Rooms							
	Vehicular Site Trips	59	38	97	63	55	118	1,634
	Shopping Center (ITE Land Use Code 820) – 100,000 Square Feet							
	Vehicular Site Trips	96	61	157	300	326	626	6,791
	High Turnover Sit-Down Restaurant (ITE Land Use Code 932) – 8,000 Square Feet							
	Vehicular Site Trips	48	44	92	53	34	87	1,017
	Total McMillan Sand Filtration Site Development							
	Vehicular Site Trips	**368**	**166**	**534**	**448**	**574**	**1,022**	**10,776**
250 Michigan Avenue	**General Office Building** (ITE Land Use Code 710) – 160,000 Square Feet							
	Total Site Trips	240	33	273	44	214	258	1,916
	Non-Auto Site Trips (15%)	*36*	*5*	*41*	*7*	*32*	*39*	*287*
	Vehicular Site Trips	204	28	232	37	182	219	1,629
	Hotel (ITE Land Use Code 310) – 200 Rooms							
	Vehicular Site Trips	59	38	97	63	55	118	1,634
	Total 250 Michigan Avenue Development							
	Total Site Trips	299	71	370	107	269	376	3,550
	Non-Auto Site Trips	*36*	*5*	*41*	*7*	*32*	*39*	*287*
	Vehicular Site Trips	**263**	**66**	**329**	**100**	**237**	**337**	**3,263**

* AM Peak hour rate based on the PM peak hour rate of the adjacent street divided by the PM peak hour rate of the generator multiplied by the AM peak hour rate of the generator.

Table 4-1 (continued)
Pipeline Development Trip Generation Summary

Development	Land Use/Trip Type	AM Peak Hour			PM Peak Hour			Weekday ADT
		In	*Out*	*Total*	*In*	*Out*	*Total*	
Catholic University of America Master Plan	**CUA Master Plan**[§] 1,996 Additional full time equivalent students							
	Vehicular Site Trips	**220**	**80**	**299**	**160**	**220**	**379**	**3,792**
Catholic University of America South Campus Redevelopment	**Block A-1/Residential Apartment** (ITE Land Use Code 220) – 303 Dwelling Units							
	Total Site Trips	30	122	152	120	64	184	1,971
	Internal Capture	-	-	-	*6*	*4*	*10*	*153*
	External Site Trips	30	122	152	114	60	174	1,818
	Non-Auto Site Trips (45%)	*14*	*55*	*68*	*51*	*27*	*78*	*818*
	External Vehicular Site Trips	**16**	**67**	**84**	**63**	**33**	**96**	**1,000**
	Block A-2/Residential Townhouse (ITE Land Use Code 230) – 55 Dwelling Units							
	Total Site Trips	5	27	32	25	12	37	386
	Internal Capture	-	-	-	*1*	*1*	*2*	*30*
	External Site Trips	5	27	32	24	11	35	356
	Non-Auto Site Trips (45%)	*2*	*12*	*14*	*11*	*5*	*16*	*160*
	External Vehicular Site Trips	**3**	**15**	**18**	**13**	**6**	**19**	**196**
	Block B/Residential Condominium (ITE Land Use Code 230) – 144 Dwelling Units							
	Total Site Trips	12	57	69	54	27	81	875
	Internal Capture	-	-	-	3	2	4	68
	External Site Trips	12	57	69	51	25	77	807
	Non-Auto Site Trips (45%)	*5*	*26*	*31*	*23*	*11*	*35*	*363*
	External Vehicular Site Trips	**7**	**31**	**38**	**28**	**14**	**42**	**444**

§ AM and PM peak hour trip rates from The Catholic University of America Campus Master Plan Update Traffic Impact Assessment prepared by O.R. George & Associates, Inc., April 2002 were applied to 1,996 potential additional full time equivalent students. The Weekday ADT was calculated by dividing the PM peak hour site trips by 10%.

Table 4-1 (continued)
Pipeline Development Trip Generation Summary

	Land Use/Trip Type	AM Peak Hour			PM Peak Hour			Weekday ADT
		In	*Out*	*Total*	*In*	*Out*	*Total*	
Catholic University of America South Campus Redevelopment	**Block C/Residential Apartment** (ITE Land Use Code 220) – 152 Dwelling Units							
	Total Site Trips	16	62	78	66	35	101	1,064
	Internal Capture	-	-	-	*3*	*2*	*5*	*83*
	External Site Trips	16	62	78	63	33	96	981
	Non-Auto Site Trips (45%)	*7*	*28*	*35*	*28*	*15*	*43*	*441*
	External Vehicular Site Trips	**9**	**34**	**43**	**35**	**18**	**53**	**540**
	Block E/Residential Condominium (ITE Land Use Code 230) – 207 Dwelling Units							
	Total Site Trips	16	76	92	73	36	109	1,191
	Internal Capture	-	-	-	*4*	*2*	*6*	*92*
	External Site Trips	16	76	92	69	34	103	1,099
	Non-Auto Site Trips (45%)	*7*	*34*	*41*	*31*	*15*	*46*	*495*
	External Vehicular Site Trips	**9**	**42**	**51**	**38**	**19**	**57**	**604**
	Retail/Arts Block /Specialty Retail Center* (ITE Land Use Code 814) – 96,010 Square Feet							
	Total Site Trips	170	185	355	111	141	252	4,255
	Internal Capture	-	-	-	*10*	*17*	*27*	*426*
	External Site Trips	170	185	355	101	124	225	3,829
	Non-Auto Site Trips (30%)	*51*	*56*	*107*	*30*	*37*	*68*	*1,149*
	External Vehicular Site Trips	119	129	248	71	87	157	2,680
	Pass-by Site Trips (34%)	40	*44*	*84*	*24*	30	*53*	*911*
	New External Vehicular Site Trips	**79**	**85**	**164**	**47**	**57**	**104**	**1,769**
	Total CUA Development							
	Total Site Trips	249	529	778	449	315	764	9,742
	Internal Capture	-	-	-	*27*	*28*	*54*	*852*
	External Site Trips	249	529	778	422	287	710	8,890
	Non-Auto Site Trips	86	*211*	296	*174*	*110*	286	3,426
	External Vehicular Site Trips	163	318	482	248	177	424	5,464
	Pass-by Site Trips	*40*	*44*	*84*	*24*	*30*	*53*	*911*
	New External Vehicular Site Trips	**123**	**274**	**398**	**224**	**147**	**371**	**4,553**

OPERATIONAL ANALYSIS

Capacity/level of service (LOS) analyses were conducted at the study intersections based on the future lane use and traffic control shown on Figure 4-1, future background traffic forecasts shown on Figure 4-4, and existing DDOT traffic signal timings provided in Appendix B. Note that the signal timings for the Michigan Avenue/Monroe Street intersection were modified based on the realignment proposed as part of the CUA South Campus project. The signal was analyzed as a two-phase signal with a northbound right-turn overlap phase. Traffic signal timings at the intersection were optimized to provide the best operation at the intersection.

The Synchro level of service results for the 2020 background conditions without the proposed development are presented in Appendix F and summarized in Table 4-2.

As shown in Table 4-2, the re-aligned Michigan Avenue/Monroe Street intersection and the Monroe Street/9th Street/WMATA Driveway intersection would operate at an overall LOS D during both the AM and PM peak hours. Furthermore, each lane group at these intersections would operate at a LOS "E" or better during both the AM and PM peak hours.

under background conditions and have additional capacity to accommodate increases in traffic

Each lane group at these intersections would operate at a LOS E or better during both the AM and PM peak hours.

The Monroe Street/10th Street intersection is projected to operate at capacity (an overall LOS "E") during both the AM and PM peak hours. Several lane groups would operate at a LOS "F" during the peak hours.

Table 4-2
2020 Background Levels of Service

Approach	AM Peak	PM Peak
Michigan Avenue/Monroe Street Re-aligned		
WBLR	E (75.5)	D (39.2)
NBT	B (19.7)	E (78.8)
NBR	A (2.3)	B (12.4)
SBT	D (50.3)	A (7.5)
Overall	**D (45.6)**	**D (43.7)**
Monroe Street/9th Street/WMATA Driveway		
EBL	A (4.7)	A (8.4)
EBTR	A (6.3)	E (65.8)
WBLTR	E (55.6)	B (10.3)
NBLTR	E (61.1)	C (34.5)
SBLTR	C (33.2)	C (36.0)
Overall	**D (39.5)**	**D (45.3)**
Monroe Street/10th Street		
EBLTR	C (23.1)	F (126.7)
WBLTR	F (95.4)	B (15.3)
NBLTR	C (33.6)	D (37.9)
SBLTR	F (121.8)	D (48.7)
Overall	**E (75.2)**	**E (79.1)**

[x.x] = unsignalized intersection control delay in sec/veh
(x.x) = signalized intersection control delay in sec/veh

QUEUE ANALYSIS

A queuing analysis was conducted for 2020 conditions without the proposed redevelopment. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 4-3. Queue reports are provided in Appendix G.

The results of the queuing analysis indicate that queues are projected to extend beyond the available storage for a few lane groups at each of the study intersections under background conditions without the proposed development.

Table 4-3
2020 Background Queue Analyses

INTERSECTION	AVAILABLE STORAGE*	QUEUE (FEET)	
		AM	PM
Michigan Avenue/Monroe Street Re-aligned			
WBLR	355	~491	202
NBT	700	255	#935
NBR	700	0	#909
SBT	330	#571	120
Monroe Street/9th Street/WMATA Driveway			
EBL	100	m3	m8
EBTR	305	m98	~827
WBLTR	225	~863	136
NBLTR	285	#185	72
SBLTR	N/A	40	51
Monroe Street/10th Street			
EBLTR	230	#596	~839
WBLTR	390	#997	322
NBLTR	285	93	121
SBLTR	290	#407	#237

* Available storage represents length of storage bays or distance to nearest intersection.
~ 50th percentile volume exceeds capacity.
# 95th percentile volume exceeds capacity.
m Volume for 95th percentile queue is metered by upstream signal. ~ 50th percentile volume exceeds capacity

Section 5
SITE ANALYSIS

OVERVIEW

The proposed development would consist of 205 to 220 multi-family residential units with approximately 12,700 SF of retail. Vehicular access to the below-grade parking garage is proposed along 9th Street. Ingress for trucks will be provided via a driveway on 10th Street and egress for trucks will be provided via the driveway on 9th Street. Trucks would enter and leave the site front first.

The site, which currently is located in the C-1 and R-2 Districts, would be rezoned to the C-2-B District.

TRIP GENERATION ANALYSIS

Overview

The total number of trips generated by the proposed development would be comprised of both internal (occurring within the confines of the site) and external trips. Additionally, a portion of the external trips would be made via non-auto modes of transportation. The trip generation is summarized in Table 5-1 and is described in detail below. Details of the trip generation analysis are provided in tabular format in Appendix H.

Total Trips

The number of trips that would be generated by the proposed redevelopment was estimated based on the Institute of Transportation Engineers' (ITE) Trip Generation.[20] Land Use Code 220 (Apartment) and Land Use Code 814 (Specialty Retail) were used for the trip generation. The number of dwelling units was used as the independent variable for the residential component and the square footage was used as the independent variable for the retail component.

Based on standard ITE rates/equations, the proposed development would generate 159 total AM peak hour trips and 191 total PM peak hour trips.

Internal Trips

A portion of the trips generated by the proposed redevelopment would be captured internally within the development. For example, a portion of individual residential trips would utilize the proposed retail uses rather than visiting retail stores outside of the area that would require travel by car. As a result of this naturally occurring synergy, the volume of external trips generated by the site would be reduced.

For purposes of this analysis, the methodology for internal capture rates outlined in the ITE Trip Generation Handbook[21] was used.

As shown in Table 5-1, 10 trips are estimated to be made internal to the site during the AM peak hour and 10 trips are estimated to be made internal to the site during the PM peak hour.

Non-auto Mode Split

A portion of the trips generated by the proposed redevelopment would be made via non-auto modes of transportation. The percentage of site-generated trips that would utilize public transportation is dependent on the proximity of the site to transit stops and the degree to which the use of public transit is encouraged, such as by implementation of a transportation demand management (TDM) program.

According to WMATA's 2005 Ridership Survey, the transit mode share is related to the distance from the development to the nearest transit station. The subject site is situated ideally to benefit from Metro's close proximity. Based on the Ridership Survey, the non-auto mode split for the residential uses on the site was estimated to be 47.2 percent and the non-auto mode split for the retail uses on the site was estimated to be 27.9 percent.

Therefore, as shown in Table 5-1, a 50 percent non-auto reduction was taken for the residential component and a 30 percent non-auto reduction was taken for the retail component.

Table 5-1
Site Trip Generation Summary

Land Use	AM Peak Hour			PM Peak Hour			ADT
	In	Out	Total	In	Out	Total	
Apartment (220 Units)							
Total Trips	22	90	112	90	49	139	1,457
Internal Trips	3	2	5	3	2	5	58
External Trips	19	88	107	87	47	134	1,399
Non-auto Trips	10	44	54	44	24	68	700
External Vehicle Trips	**9**	**44**	**53**	**43**	**23**	**66**	**699**
Specialty Retail Center (12,700 SF)							
Total Trips	23	24	47	23	29	52	581
Internal Trips	2	3	5	2	3	5	58
External Trips	21	21	42	21	26	47	523
Non-auto Trips	6	6	12	6	8	14	157
External Vehicle Trips	**15**	**15**	**30**	**15**	**18**	**33**	**366**
Total Site Trips							
Total Trips	45	114	159	113	78	191	2,038
Internal Trips	5	5	10	5	5	10	116
External Trips	40	109	149	108	73	181	1,922
Non-auto Trips	16	50	66	50	32	81	857
External Vehicle Trips	**24**	**59**	**83**	**58**	**41**	**99**	**1,065**

Accordingly, 66 AM peak hour trips and 81 PM peak hour trips are projected to be made by non-auto modes of transportation, as shown on Table 5-1.

External Vehicle Trips

Taking into account internal trips stemming from the synergistic relationship of the uses and the non-auto mode share, the proposed development would generate an estimated 83 AM peak hour external vehicular trips and 99 PM peak hour external vehicular trips, as shown on Table 5-1.

SITE TRIP DISTRIBUTION

The distribution of peak hour trips generated by the proposed redevelopment was based on existing traffic patterns in the study area and the premise that commuters will select routes that minimize travel time. The distribution of site trips for the residential and retail portions would differ slightly as outlined in Table 5-2. These percentages were utilized for the AM and PM peak hours.

Table 5-2
Distribution of Site Trips

Roadway	Direction (to/from)	Residential Distribution	Retail Distribution
Michigan Avenue	South	50%	35%
Monroe Street	East	10%	10%
9th Street	North	10%	20%
9th Street	South	30%	35%
TOTAL		100%	100%

SITE TRAFFIC ASSIGNMENTS

The site-generated traffic volumes were assigned to the public roadway network according to the directional distribution described above. The traffic assignments associated with each of the land uses are included in Appendix H. The resulting site traffic assignments are shown on Figure 5-1.

PARKING REQUIREMENTS

According to the District of Columbia Municipal Regulations (DCMR),[22] one parking space for each three dwelling units is required in the C-2-B zoning district for the residential use and one parking space for each 750 SF in excess of 3,000 SF is required in the C-2-B zoning district for the retail use. Therefore, a total of 90 parking spaces would be required for the proposed development. The proposed development would provide approximately 150 parking spaces. Of the 150 spaces, 113 to 137 will be designated as residential parking spaces; 13 to 37 spaces will be designated as retail spaces.

Assuming 113 residential spaces (minimum proposed) and 220 residential units (maximum proposed), a minimum of 0.51 spaces per unit would be provided.

In order to determine the appropriateness of the proposed parking ratio, parking ratios for similar residential developments within close proximity of a metro station were reviewed. To evaluate the parking needs, we have compiled a list of parking supplies for eight multi-family residential developments in Washington, D.C. within one-half mile of a Metro station, as shown in Table 5-3. The parking ratios ranged from 0.14 spaces per unit to 1.00 spaces per unit with an average of 0.58 spaces per unit. Five of the sites were located within one-third mile of a Metro station. For those sites, the parking ratios ranged from 0.14 spaces per unit to 0.98 spaces per unit with an average of 0.46 spaces per unit. Two of the sites were located within one-quarter of a mile of a Metro station (as is the case with the subject development). For those sites, the parking ratios ranged from 0.14 spaces per unit to 0.17 spaces per unit with an average of 0.155 spaces per unit.

Based on this data, the proposed parking ratio is appropriate and impacts to street parking are not anticipated.

BICYCLE REQUIREMENTS

According to the DCMR,[23] the number of bicycle parking spaces provided shall be at least equal to five percent of the number of automobile parking spaces provided. Therefore, a total of five bicycle parking spaces would be required for the proposed

development. The proposed development would provide approximately 60 to 80 bicycle parking spaces.

LOADING REQUIREMENTS

For retail areas with 5,000 SF to 20,000 SF of space, the DCMR requires one 30-foot deep loading berth and a 100 SF loading platform.[24]

Residential buildings with more than 50 units require one 55-foot deep loading berth, one 200 SF loading platform, and one 20 foot-deep service/delivery platform.

Due to the limited width of 10th Street, 55-foot trucks would not be able to access the site. Therefore, the Applicant is seeking relief from the requirement to provide a 55-foot loading berth and is proposing to provide a 30-foot loading berth with a 400 SF loading platform and two 30-foot loading spaces.

The Applicant has created a loading management plan (described in detail in Section 3) that restricts 55-foot trucks from accessing the site. In the rare case that a resident would use a truck of that size to move in or out, the loading management plan requires that they obtain a permit through DDOT to establish a temporary, curbside loading zone.

Section 6
TOTAL FUTURE CONDITIONS

TOTAL FUTURE TRAFFIC FORECASTS

Total future traffic forecasts with the proposed development were determined by combining the 2020 background traffic forecasts shown in Figure 4-4 with the site traffic volumes shown on Figure 5-1 to yield the 2020 total future traffic forecasts shown on Figure 6-1.

PROPORTIONAL IMPACT ANALYSIS

In order to determine the amount of traffic on the surrounding roadways that would be attributable to the proposed redevelopment, a proportional impact assessment was conducted. That is, the total future traffic volumes were compared to the background traffic volumes to determine the impact of adding the site trips to the study intersections. Table 6-1 displays the results of the proportional impact analysis.

Table 6-1
Proportional Impact Analysis

Intersection	AM Peak	PM Peak
Michigan Avenue/Monroe Street	< 1%	1.0%
Monroe Street/9th Street/ WMATA Driveway	2.0%	3.8%
Monroe Street/10th Street	2.8%	1.3%

Site impacts of five percent or less are low and generally reflect negligible effects on traffic operations and delays. Site impacts between five and 15 percent generally are considered moderate and minor effects on traffic operations and delays could be expected. Site impacts of more than 15 percent generally are considered significant.[25]

As shown in Table 6-1, the proportional impact at the off-site intersections is expected to be insignificant.

OPERATIONAL ANALYSIS

A future conditions capacity analysis, with the proposed development, was performed at the study intersections utilizing 2020 projected total future traffic volumes shown on Figure 6-1, the lane use and traffic controls shown on Figure 4-1, and existing DDOT traffic signal timings included in Appendix B. At the Michigan Avenue/Monroe Street intersection, the signal timings were consistent with those utilized under background conditions.

The analysis is summarized in Table 6-2 and the results are included in Appendix I.

As shown in Table 6-2, the proposed redevelopment would have some impact on the study intersections. Specifically, the westbound approach at the re-aligned Michigan Avenue/Monroe Street intersection would drop from a LOS "E" to a LOS "F" during the AM peak hour. The northbound approach at the Monroe Street/9th Street/WMATA driveway is projected to drop from a LOS "E" to a LOS "F" during the AM peak hour. Likewise, the eastbound through/right lane is projected to drop from a LOS "E" to a LOS "F" during the PM peak hour. Also during the PM peak hour, the overall level of service is projected to drop from a LOS "D" to a LOS "E". At the Monroe Street/10th Street intersection, the overall level of service is projected to drop from a LOS "E" to a LOS "F" during the PM peak hour.

Table 6-2
2020 Total Future Levels of Service

Approach	AM Peak	PM Peak
Michigan Avenue/Monroe Street Re-aligned		
WBLR	F (86.5)	D (42.3)
NBT	B (19.7)	E (78.8)
NBR	A (2.4)	B (14.9)
SBT	D (50.3)	A (7.5)
Overall	**D (48.7)**	**D (44.4)**
Monroe Street/9th Street/WMATA Driveway		
EBL	A (4.7)	A (8.5)
EBTR	A (6.3)	F (80.0)
WBLTR	E (61.0)	E (66.7)
NBLTR	F (97.9)	D (37.8)
SBLTR	C (33.1)	D (36.2)
Overall	**D (46.8)**	**E (70.9)**
Monroe Street/10th Street		
EBLTR	C (27.5)	F (138.1)
WBLTR	F (96.3)	B (15.5)
NBLTR	C (33.6)	D (37.9)
SBLTR	F (126.4)	D (50.6)
Overall	**E (77.8)**	**F (85.2)**
9th Street/Site Driveway		
WBLR	A [9.9]	A [9.5]
SBLT	A [2.0]	A [2.5]

[x.x] = unsignalized intersection control delay in sec/veh
(x.x) = signalized intersection control delay in sec/veh

Section 7
IMPROVEMENT ANALYSIS

OVERVIEW

An incremental series of improvements were evaluated to determine the level of improvements necessary to offset the impact of the additional traffic generated as a result of the proposed redevelopment. The incremental series of improvements included timing improvements at each of the signalized intersections.

OPERATIONAL ANALYSIS WITH INCREMENTAL IMPROVEMENTS

A future conditions capacity analysis, with improvements, was performed at the study intersections utilizing the lane use and traffic controls shown on Figure 4-1, the 2020 projected total future traffic volumes shown on Figure 6-1 and the adjusted signal timings.

The proposed timing adjustments at each of the intersections involved shifting green time only. Table 7-1 summarizes the adjusted green times.

Table 7-1
Signal Timing Adjustments†

AM Peak	PM Peak
Michigan Avenue/Monroe Street	
WB = +1 Sec. NB/SB = - 1 Sec.	None
Monroe Street/9th Street/WMATA Driveway	
EB/WB = -2 Sec. NB/SB = + 2 Sec.	EB/WB = +4 Sec. NB/SB = -4 Sec.
Monroe Street/10th Street	
None	EB/WB = +2 Sec. NB/SB = -2 Sec.

† All timing adjustment are referenced to the existing signal timings at the various intersections

Table 7-2 summarizes the results of the analysis. Level of service reports for total future conditions with improvements are provided in Appendix J.

Table 7-2
2020 Total Future Levels of Service with Improvements

Approach	AM Peak	PM Peak
Michigan Avenue/Monroe Street Re-aligned		
WBLR	E (73.8)	D (42.4)
NBT	C (20.6)	E (78.8)
NBR	A (2.4)	B (14.9)
SBT	E (57.5)	A (7.5)
Overall	**D (48.5)**	**D (44.4)**
Monroe Street/9th Street/WMATA Driveway		
EBL	A (4.9)	A (6.6)
EBTR	A (6.6)	D (48.9)
WBLTR	E (75.1)	B (12.1)
NBLTR	E (75.5)	D (45.9)
SBLTR	C (31.1)	D (42.0)
Overall	**D (52.1)**	**D (36.6)**
Monroe Street/10th Street		
EBLTR	C (27.4)	F (122.3)
WBLTR	F (96.3)	B (13.9)
NBLTR	C (33.6)	C (41.4)
SBLTR	F (126.4)	E (60.8)
Overall	**E (77.6)**	**E (78.0)**
9th Street/Site Driveway		
WBLR	A [9.9]	A [9.5]
SBLT	A [2.0]	A [2.5]

[x.x] = unsignalized intersection control delay in sec/veh
(x.x) = signalized intersection control delay in sec/veh

TOTAL FUTURE WITH IMPROVEMENTS QUEUE ANALYSIS

A queuing analysis was conducted to determine the impact that the proposed redevelopment would have on queue lengths in the study area. Synchro was used to conduct the analyses, using the 95th percentile queue lengths. The results are summarized in Table 7-3. Queue reports are provided in Appendix K.

The projected queues with the proposed redevelopment are within two car lengths of the queues projected under background conditions without the proposed redevelopment.

A "Do Not Block Driveway" sign should be installed on 9th Street in advance of the proposed driveway to prevent cars queued at the signal from blocking the driveway.

Table 7-3
2020 Total Future Queue Analysis with Improvements

INTERSECTION	AVAILABLE STORAGE*	QUEUE (FEET)	
		AM	PM
Michigan Avenue/Monroe Street Re-aligned			
WBLR	355	~501	208
NBT	700	261	#935
NBR	700	0	#950
SBT	330	#580	120
Monroe Street/9th Street/WMATA Driveway			
EBL	100	m3	m7
EBTR	305	m98	~827
WBLTR	225	~875	~m135
NBLTR	55	#238	107
SBLTR	N/A	39	55
Monroe Street/10th Street			
EBLTR	230	M#622	~#770
WBLTR	390	#999	307
NBLTR	285	93	125
SBLTR	290	#414	#269
9th Street/Site Driveway			
WBLR	N/A	8	5
SBLT	N/A	1	2

* Available storage represents length of storage bays or distance to nearest intersection. .
~ 50th percentile volume exceeds capacity.
# 95th percentile volume exceeds capacity.
m Volume for 95th percentile queue is metered by upstream signal. ~ 50th percentile volume exceeds capacity.

Section 8

TRANSPORTATION DEMAND MANAGEMENT AND LOADING MANAGEMENT PLAN

OVERVIEW

The 901 Monroe Street, NE site is considered to be "very walkable" and has "Excellent Transit" according to the Walk Score website (www.walkscore.com). In fact, the site scores 88 out of a possible 100 on the walk score scale and 73 out of a possible 100 on the transit score scale. The walk score considers how close various amenities, such as restaurants, coffee shops, grocery stores, stores, schools, parks, and banks, are to the site. The transit score considers how close rail and bus services are to the site. The scales utilized by Walk Score are shown in Table 8-1.

By the very nature of the proposed development's proximity to the Brookland – CUA Metro Station, and its proximity to other amenities, the site will naturally experience a higher non-auto mode split than similar developments without those advantages.

Table 8-1
Walk and Transit Score Scales

WALK SCORE	DESCRIPTION
90–100	Walker's Paradise — Daily errands do not require a car.
70–89	Very Walkable --- Most errands can be accomplished on foot.
50–69	Somewhat Walkable — Some amenities within walking distance.
25–49	Car-Dependent — A few amenities within walking distance.
0–24	Car-Dependent — Almost all errands require a car.
TRANSIT SCORE	**DESCRIPTION**
90–100	Rider's Paradise — World-class public transportation.
70–89	Excellent Transit — Transit is convenient for most trips.
50–69	Good Transit — Many nearby public transportation options.
25–49	Some Transit — A few nearby public transportation options.
0–24	Minimal Transit — It is possible to get on a bus.

Transportation Demand Management Plan

While the location of the proposed development is expected to naturally encourage the use of transit, the Applicant has also identified several other strategies to encourage the use of non-auto modes of transportation. Specifically:

1. The Applicant currently is in coordination with Zipcar to determine the feasibility of locating Zipcars on site. The final determination on whether and how many Zipcars will be located at the site will be made by Zipcar.

2. Significant bicycle parking will be provided on-site for both retail employees and residents. Bicycle parking for the retail employees will be provided on the first floor. Bicycle parking for the residents will be provided on the garden level.

3. Shower and changing facilities will be provided on site for employees who wish to walk, jog, or bike to work.

4. A business center will be provided in the residential building for residents who telecommute.

Loading Management Plan

The site has been designed to accommodate trucks up to 45-feet in length. Trucks will access the site front-first via 10th Street and will exit the site front-first via 9th Street. No backing maneuvers will be required on public streets. Truck diagrams are provided in Appendix L.

A truck management plan has been developed to promote safe and efficient travel for all users, (e.g. cars, trucks, and pedestrians) and to set forth guidelines and procedures for loading and delivery operations that will avoid adverse impacts on the residents of the proposed building and the surrounding community. The following are the components of the truck management plan:

1) A member of the on-site management team will be designated as a loading coordinator (duties may be part of other duties assigned to the individual). He or she will coordinate all loading activities of the residential building (including deliveries, trash disposal, and residential move-in and move-out activities). The loading coordinator will be responsible for informing tenants of the guidelines and procedures for loading and delivery operations. The loading coordinator will inform tenants of DDOT's regulations for moving trucks and will work with tenants when applying for DDOT permits for moving trucks.

2) A lease provision will require all tenants to use only the loading dock for deliveries and move-in/move-out activities, except in special circumstances as outlined in #5 below.

3) A lease provision will restrict all tenants from using trucks longer than 45.5 feet (WB-40), except in special circumstances as outlined in #5 below.

4) All tenants will be required to notify the loading coordinator before moving in or out so that the loading coordinator can ensure no conflicting loading activities will occur and the proper permits, as required, can be obtained from DDOT. The tenant shall provide the loading coordinator the following information: time and date that the truck is anticipated to arrive, size of truck being used, and name of the moving service.

5) In the rare event that a truck longer than 45.5 feet (WB-40) is required, in accordance with DDOT policies, a permit is required and a temporary no parking zone can be established on an adjacent street to allow for curb-side loading or unloading adjacent to the building. In this case, the tenants shall notify the loading manager at least four weeks in advance so proper permits can be obtained from DDOT and "Emergency No Parking" signs issued. The tenant shall provide the loading coordinator the following information: time and date that the truck is anticipated to arrive, size of truck being used, and name of the moving service.

6) Permits are required by DDOT for trucks over 40 feet long. The loading coordinator will assist tenants in obtaining appropriate permits; however, issuance of permits is at the discretion of DDOT.

7) No truck idling shall be permitted anywhere on the premises.

Section 9
CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of this study are as follows:

12. The subject site is proposed to be rezoned from the C-1 and R-2 Districts to the C-2-B District to accommodate the construction of a 205 to 220 multi-family residential units with approximately 12,700 SF of retail.

13. The subject site is well-served by Metro and is located across Monroe Street from the Brookland-CUA Metro Station.

14. Under 2020 background conditions without the proposed redevelopment), the Monroe Street/10th Street intersection would operate at capacity.

15. Taking into account internal trips stemming from the synergistic relationship of the uses, the non-auto mode share, and pass-by trips to/from the retail uses, the proposed development would generate an estimated 83 AM peak hour vehicle trips and 99 PM peak hour vehicle trips.

16. At the off-site study intersections, the number of trips generated by the proposed redevelopment is expected to account for four percent or less of the total future traffic.

17. According to the parking requirements outlined in the District of Columbia Municipal Regulations (DCMR), 87 on-site parking spaces would be required for the proposed redevelopment. The proposed development plan would provide approximately 150 parking spaces.

18. According to the bicycle requirements outlined in the DCMR, five bicycle parking spaces would be required for the proposed redevelopment. The proposed development plan would provide approximately 60 to 80 bicycle parking spaces.

19. The existing pedestrian facilities, along with the sidewalk reconstruction and the bulb-outs proposed along the property's frontage, will adequately accommodate the anticipated pedestrian traffic from the proposed development.

20. The proposed redevelopment will not have a significant impact on the traffic operations in the study area.

21. The increase in traffic at the study intersections could be offset by the timing improvements at each of the signalized intersections.

22. A "Do Not Block Driveway" sign should be installed on 9th Street in advance of the proposed driveway to prevent vehicles from blocking the driveway.

REFERENCES

[1] Brookland Multi-Modal Transportation and Streetscape Study, District Department of Transportation, Transportation Planning and Policy Administration, Washington, D.C., March 2007.

[2] Ibid.

[3] Brookland/CUA Metro Station Small Area Plan Master Plan Report, Washington D.C. Office of Planning, Washington, D.C., December 10, 2007.

[4] Brookland/CUA Metro Station Small Area Plan Master Plan Report, Washington D.C. Office of Planning, Washington, D.C., December 10, 2007.

[5] 2008 Traffic Volumes, District Department of Transportation, Traffic Services Administration, Washington, D.C., [http://ddot.dc.gov/ddot/frames.asp?doc=/ddot/lib/ddot/information/maps/trafficvolume/2008_citywide.pdf].

[6] 2009 Traffic Volumes, District Department of Transportation, Traffic Services Administration, Washington, D.C., [http://ddot.dc.gov/ddot/frames.asp?doc=/ddot/lib/ddot/information/maps/trafficvolume/2009_citywide.pdf].

[7] Ibid.

[8] District Department of Transportation, Metropolitan Branch Trail Concept Plan, [http://www.metbranchtrail.com/]..

[9] District Department of Transportation, District of Columbia Pedestrian Master Plan, May 2008, [http://www.tooledesign.com/projects/dc/].

[10] District Department of Transportation, District of Columbia Bicycle Master Plan, April 2005.

[11] Ibid.

[12] Highway Capacity Manual, Transportation Research Board, Washington D.C., 2000.

[13] District Department of Transportation, Design and Engineering Manual, April 2009

[15] Catholic University of America, University Facts, December 2011, [http://www.cua.edu/about-cua/university-facts.cfm]

[16] Trip Generation, 7th Edition, Volume 2, Institute of Transportation Engineers, Washington, D.C., 2003.

[17] Campus Master Plan, Highlights, The Catholic University of America, The Department of Facilities Planning and Construction, November 2008.

[18] Catholic University of America Campus Master Plan Update - Traffic Impact Assessment, O. R. George & Associates, Inc., April 2002.

[20] Trip Generation, 8th Edition, Institute of Transportation Engineers, Washington, D.C., 2008.

[21] Trip Generation Handbook Institute of Transportation Engineers, Washington, D.C., 2001.

[22] District of Columbia Municipal Regulations, Title 11-Zoning, Section 2101.1, 2001 Edition.

[23] District of Columbia Municipal Regulations, Title 11-Zoning, Section 2119.2, 2001 Edition.

[24] District of Columbia Municipal Regulations, Title 11-Zoning, Section 2201.1, 2001 Edition.

[25] Connecticut Avenue Transportation Study – Draft Final Report, DMJM+Harris, Inc., June 2003.

FIGURES

Figure 1-1
Site Location Map

M Brookland-CUA Metro Station

North

9th & Monroe Streets, NE
Washington, DC

WELLS + ASSOCIATES

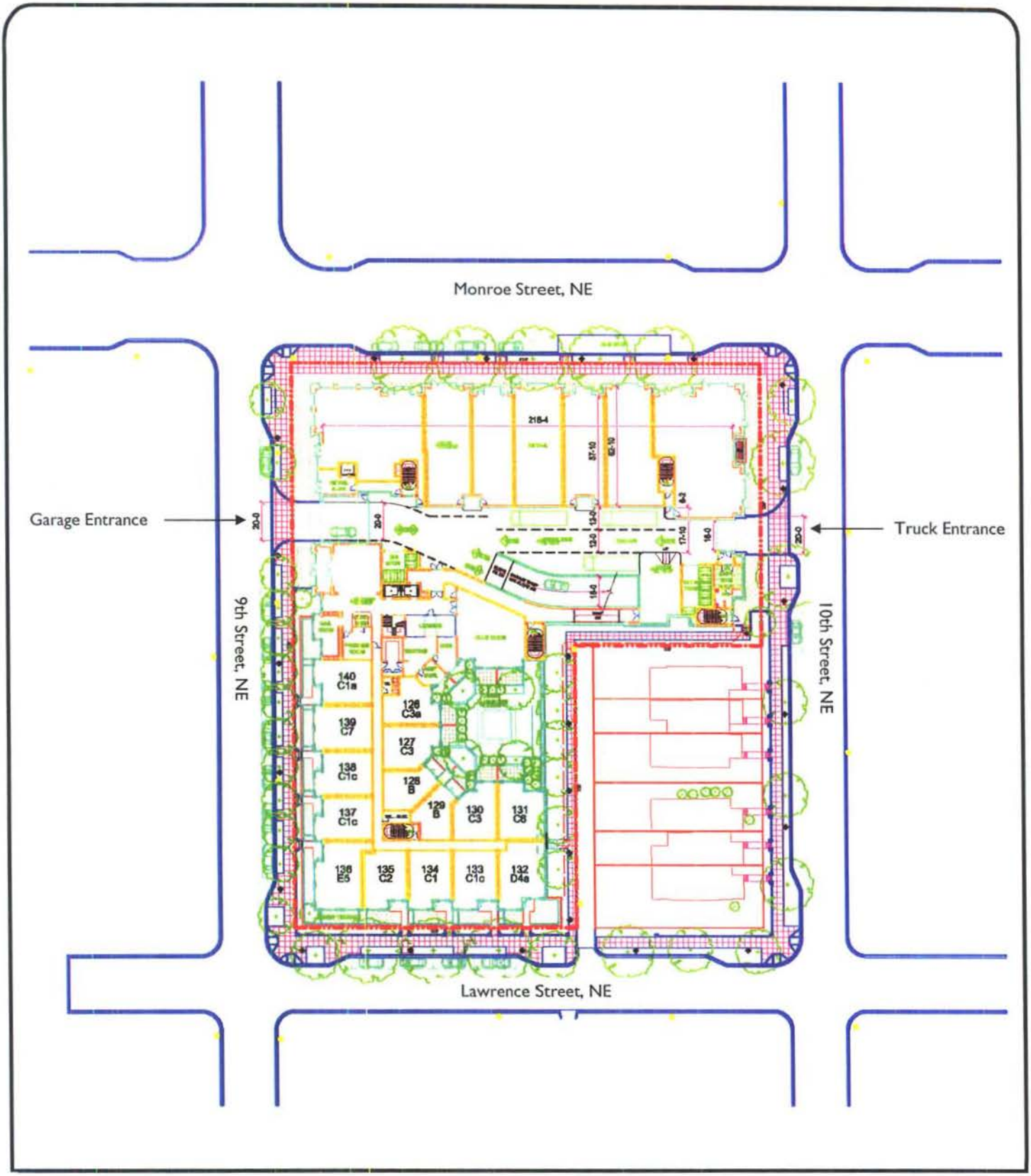

Figure 1-2
Site Plan

North

9th & Monroe Streets, NE
Washington, DC

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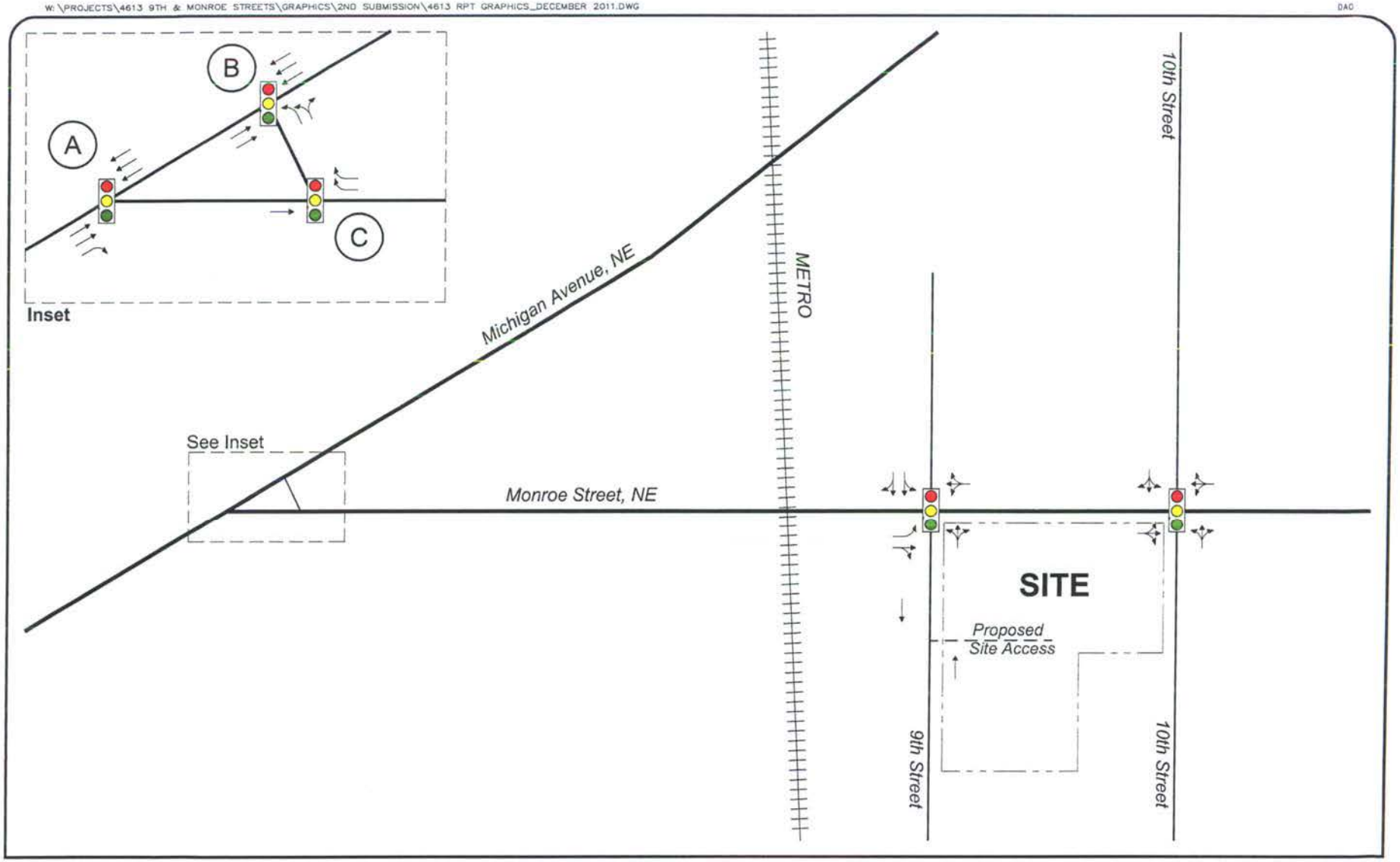
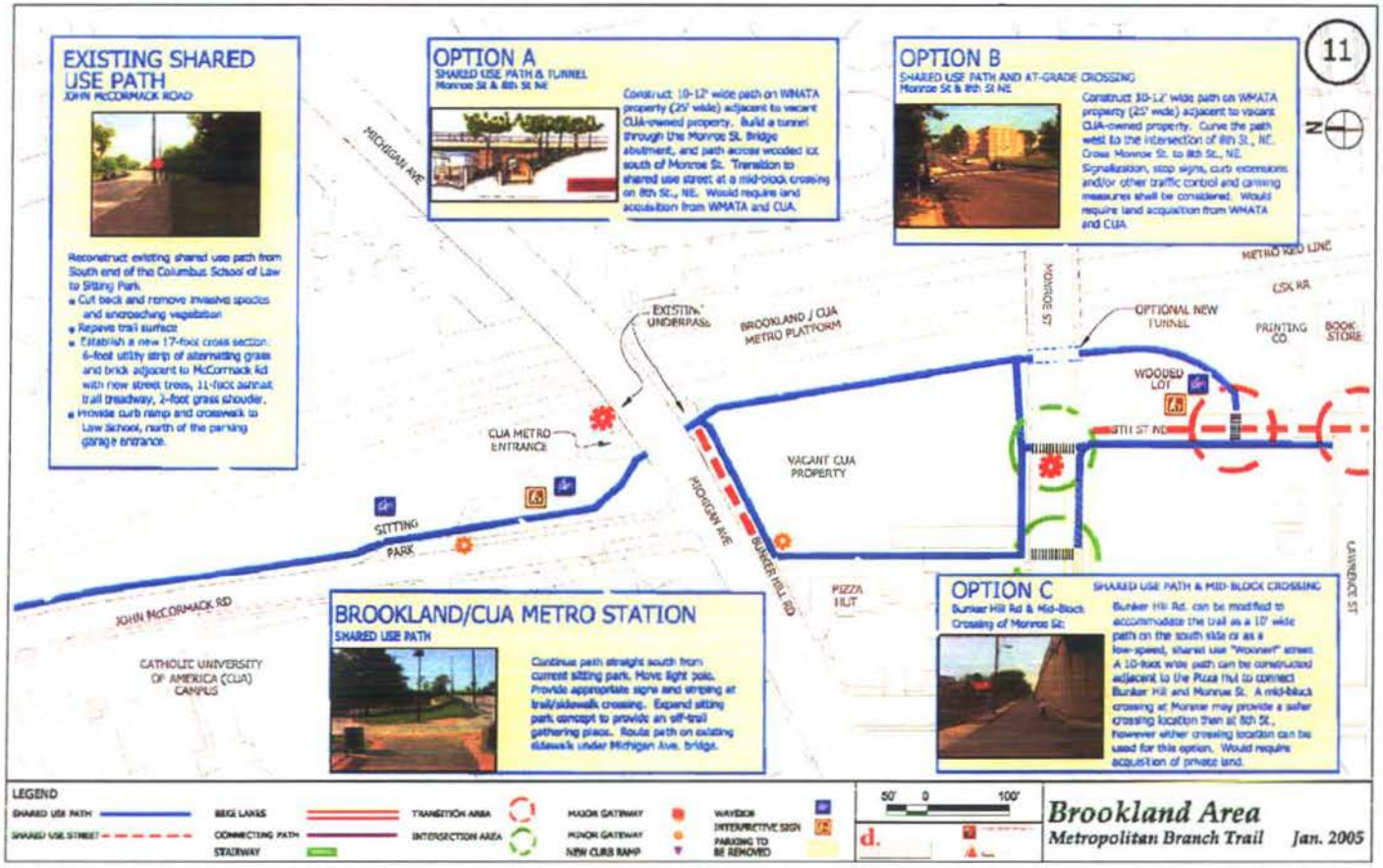


Figure 2–1
Existing Lane Use and Traffic Control

← Represents One Travel Lane
Signalized Intersection
Stop Sign

North



Source: DDOT Metropolitan Branch Trail Draft Concept Plan

Figure 2–2
Metropolitan Branch Trail Concept Plan

North

9th and Monroe Streets, NE
Washington, D.C.

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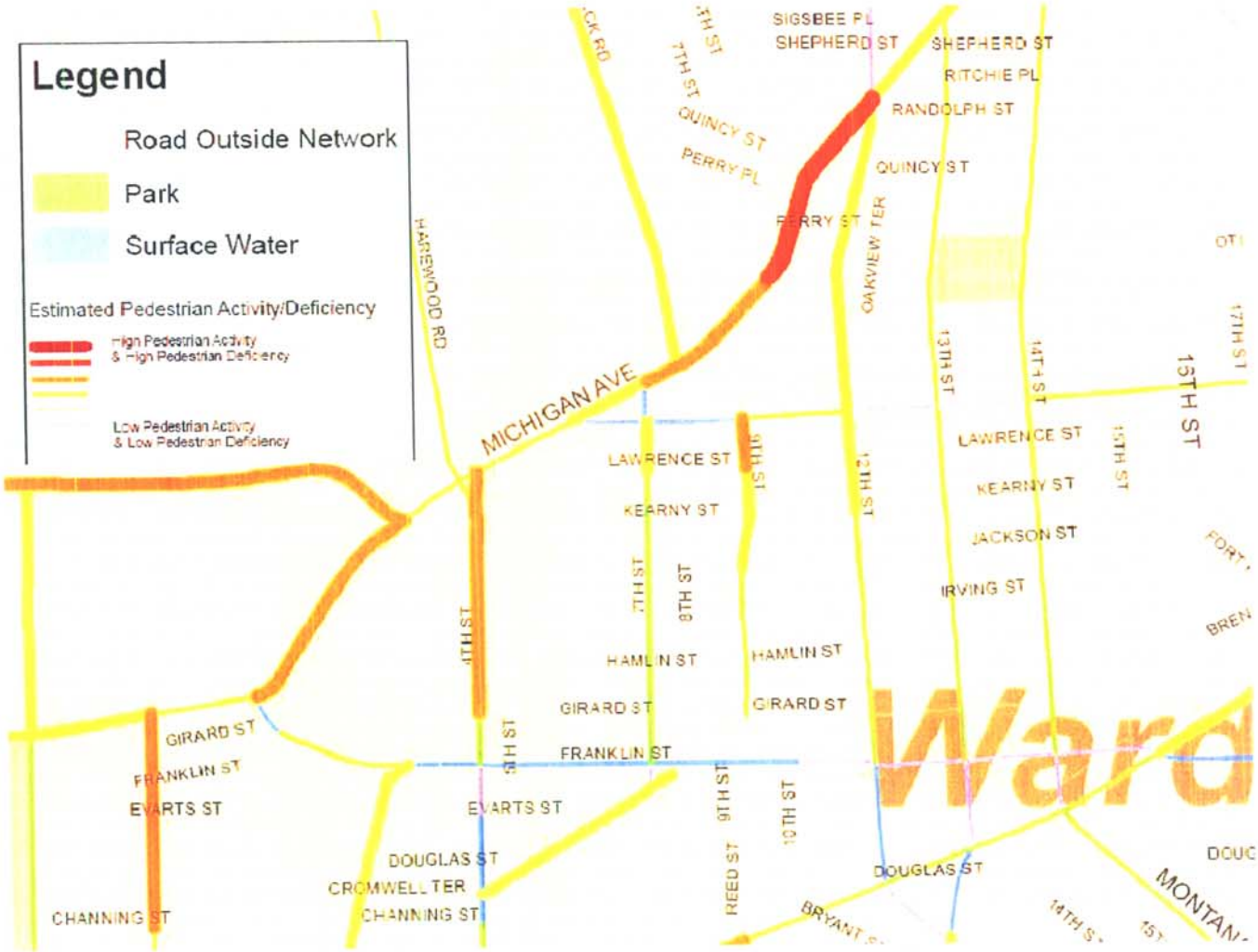

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Figure 2–3
Pedestrian Master Plan

North

9th and Monroe Streets, NE
Washington, D.C.

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Figure 2–4
Bicycle Levels of Service

North

9th and Monroe Streets, NE
Washington, D.C.

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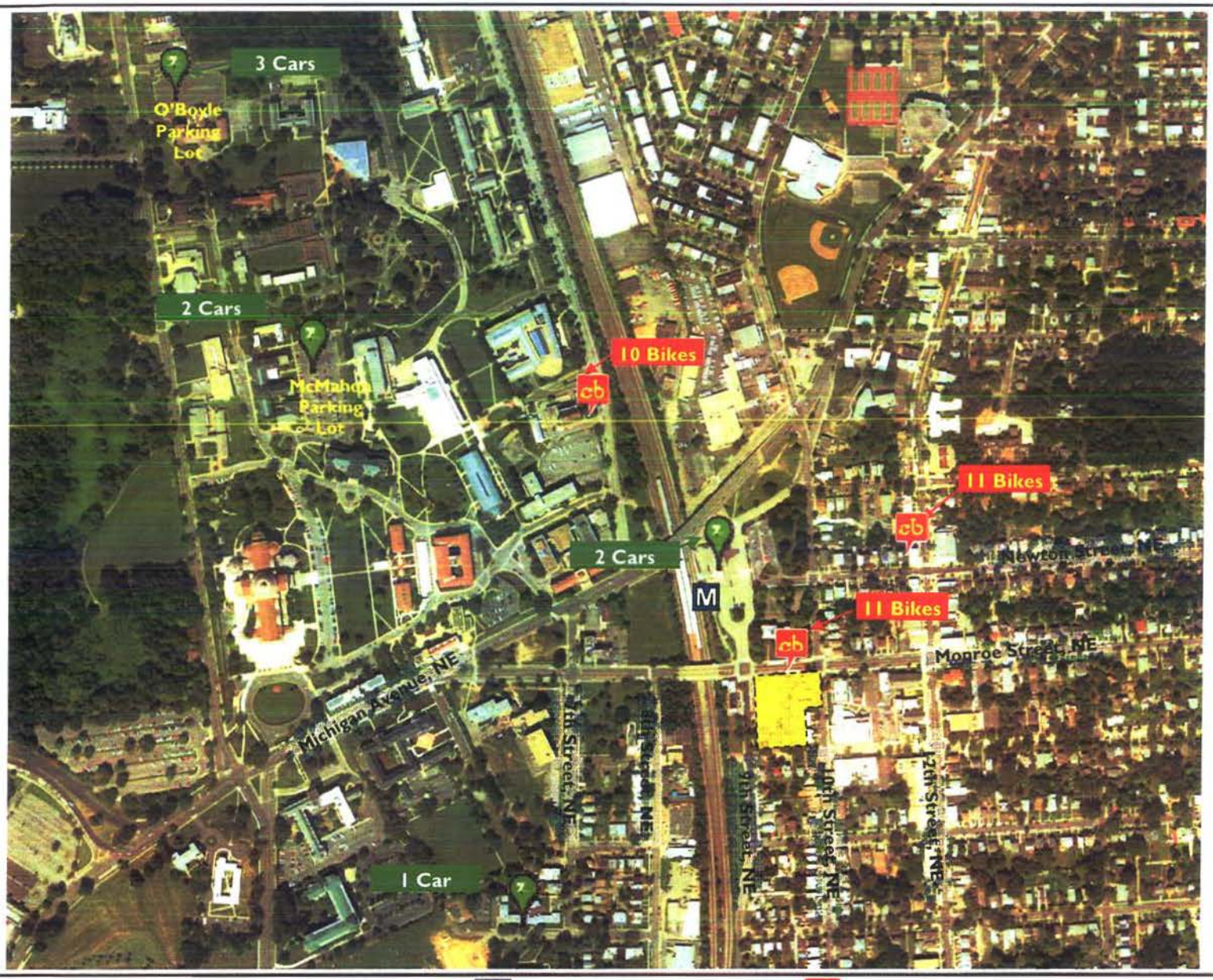

Figure 2-5
Current Zipcar and Capital Bikeshare Locations

M Brookland-CUA Metro Station

Proposed Site

Current Capital Bikeshare Locations

Current Zipcar Locations

North

9th & Monroe Streets, NE
Washington, DC

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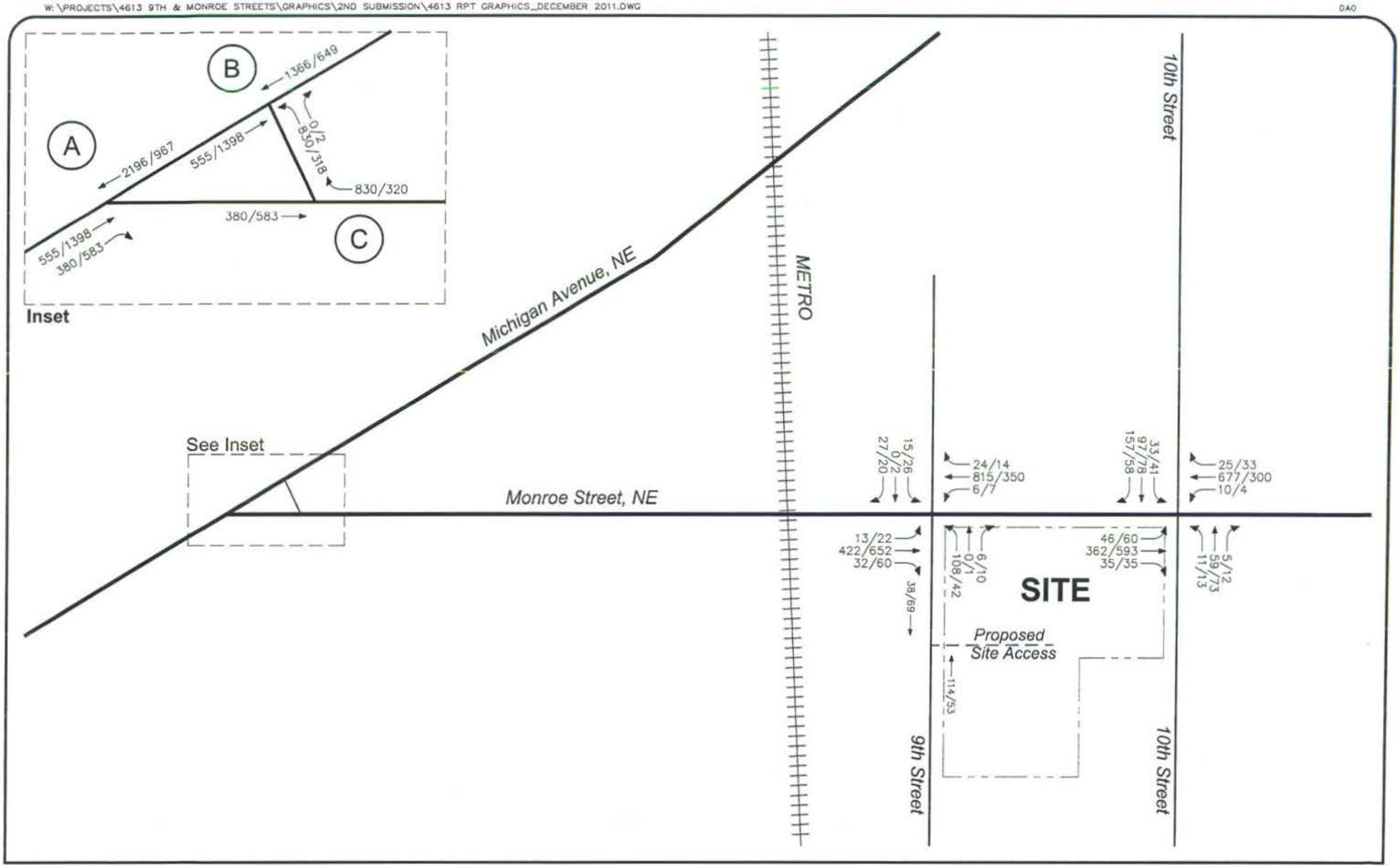

Figure 3–1
Existing Peak Hour Traffic Volumes

9th & Monroe Streets, NE
Washington, D.C.

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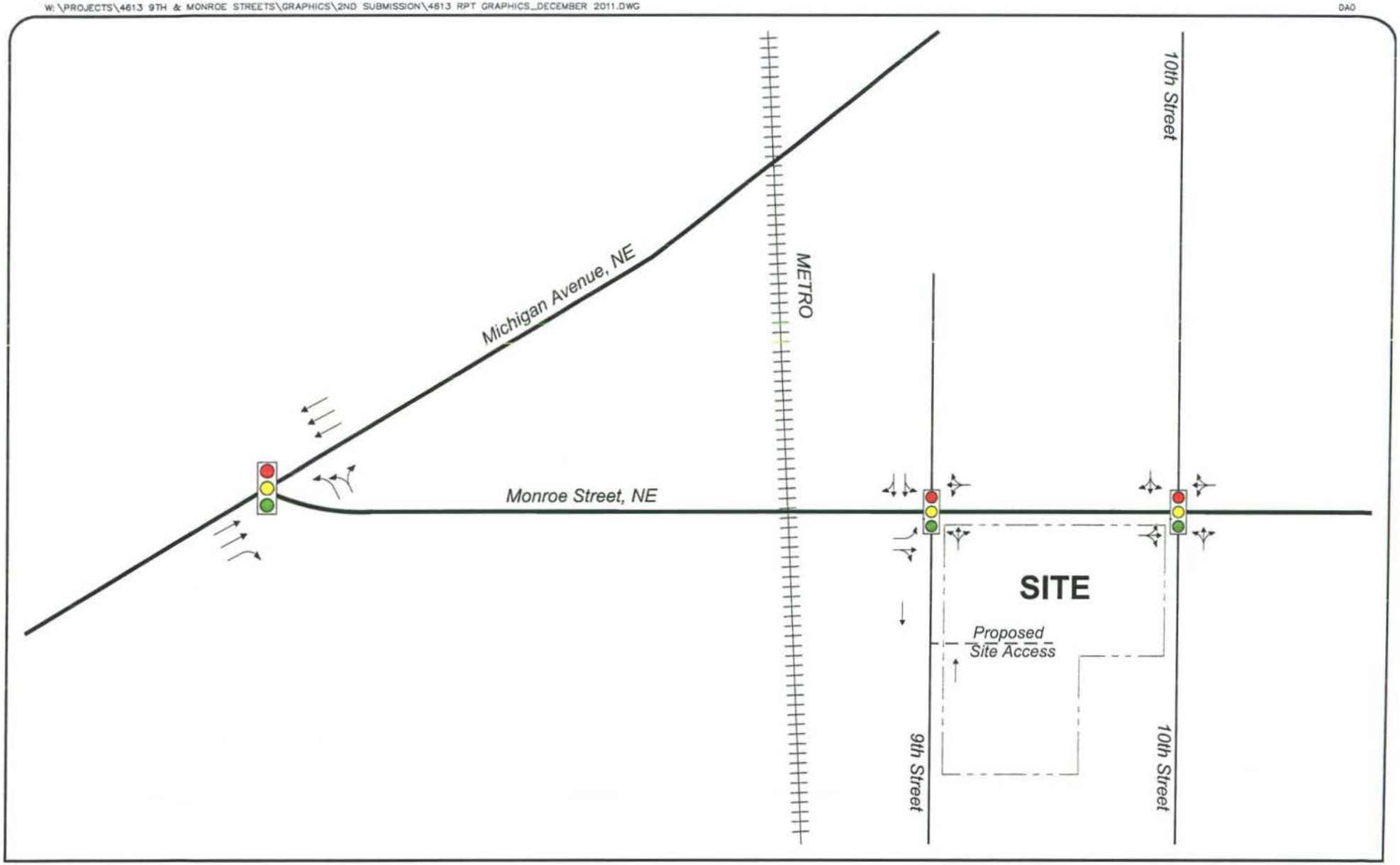

Figure 4–1
Background Lane Use and Traffic Control

9th & Monroe Streets, NE
Washington, D.C.

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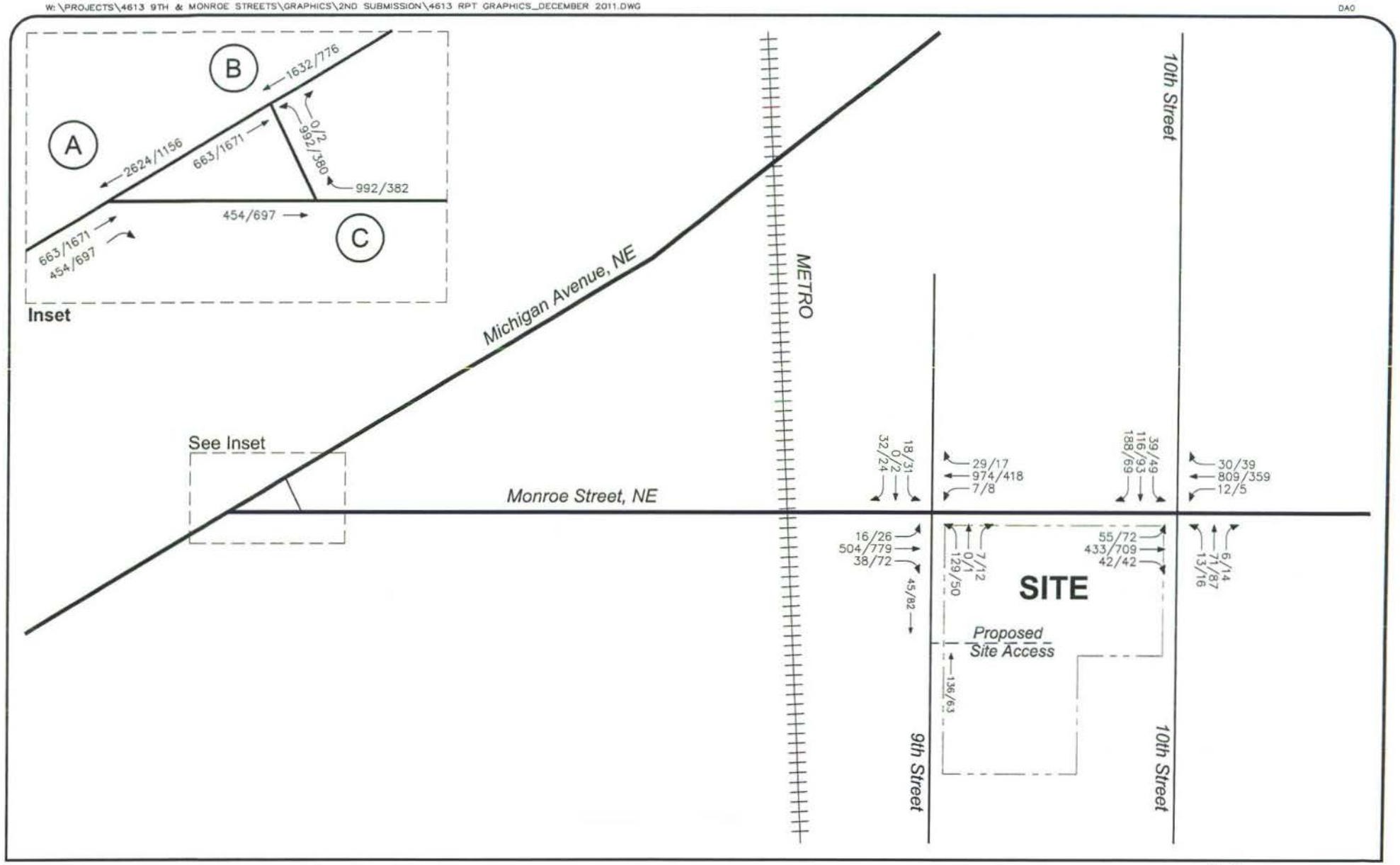

Figure 4–2
Existing Peak Hour Traffic Volumes with Regional Growth (2020)

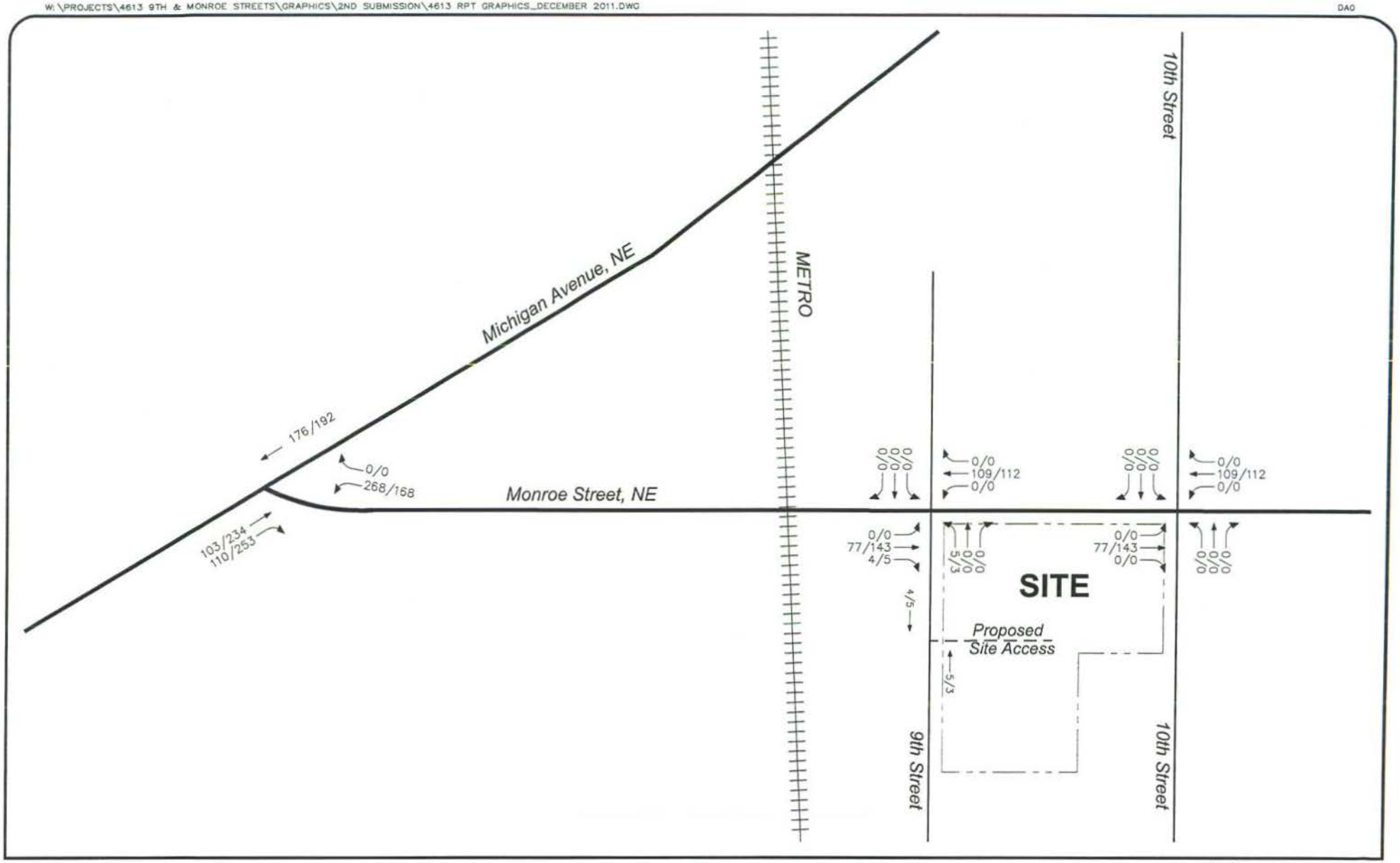

Figure 4–3
Pipeline Development Traffic Assignments

9th & Monroe Streets, NE
Washington, D.C.

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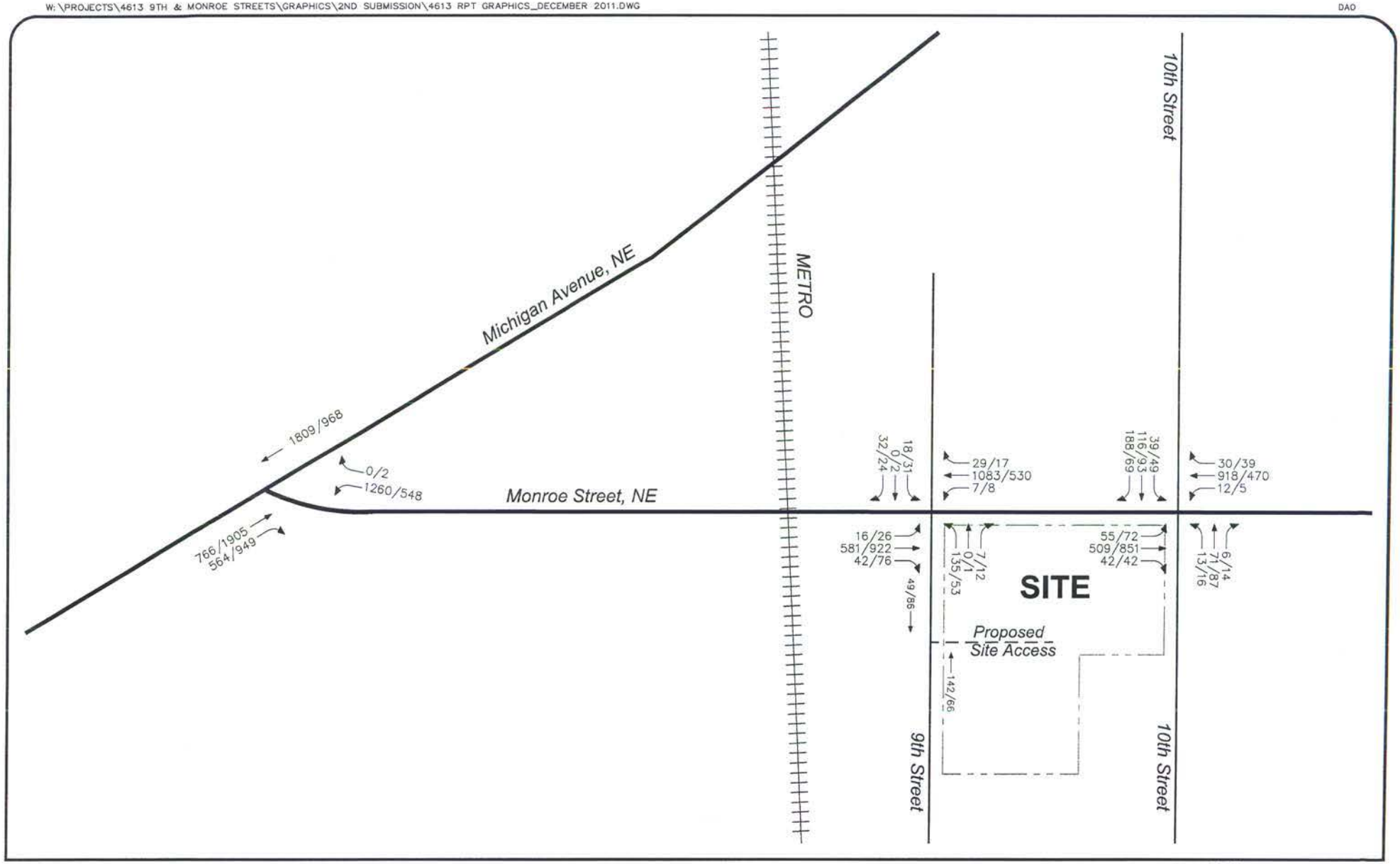

Figure 4–4
2020 Future Background Peak Hour Traffic Forecasts

9th & Monroe Streets, NE
Washington, D.C.

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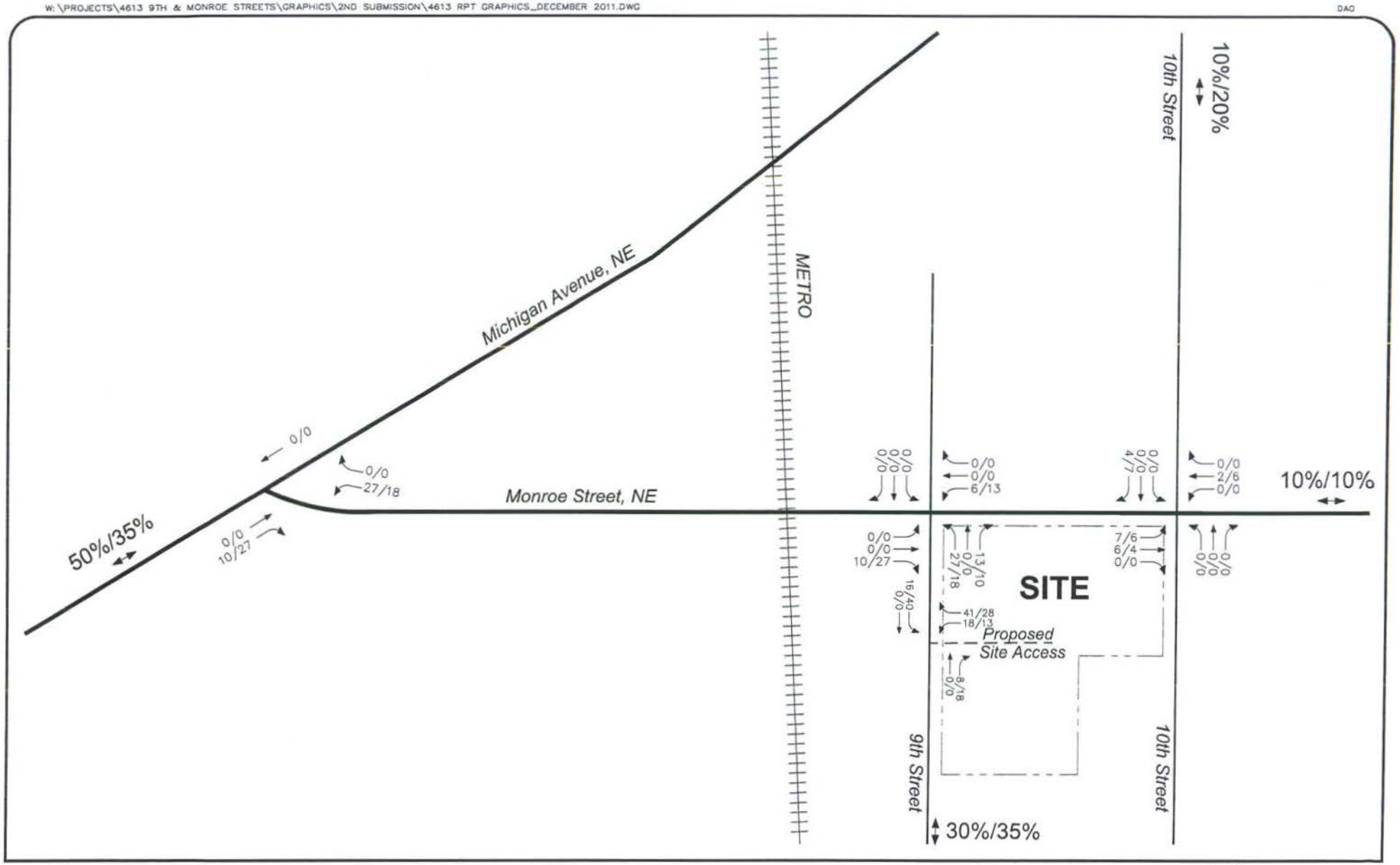

Figure 5–1
Site Trip Distribution and Assignments

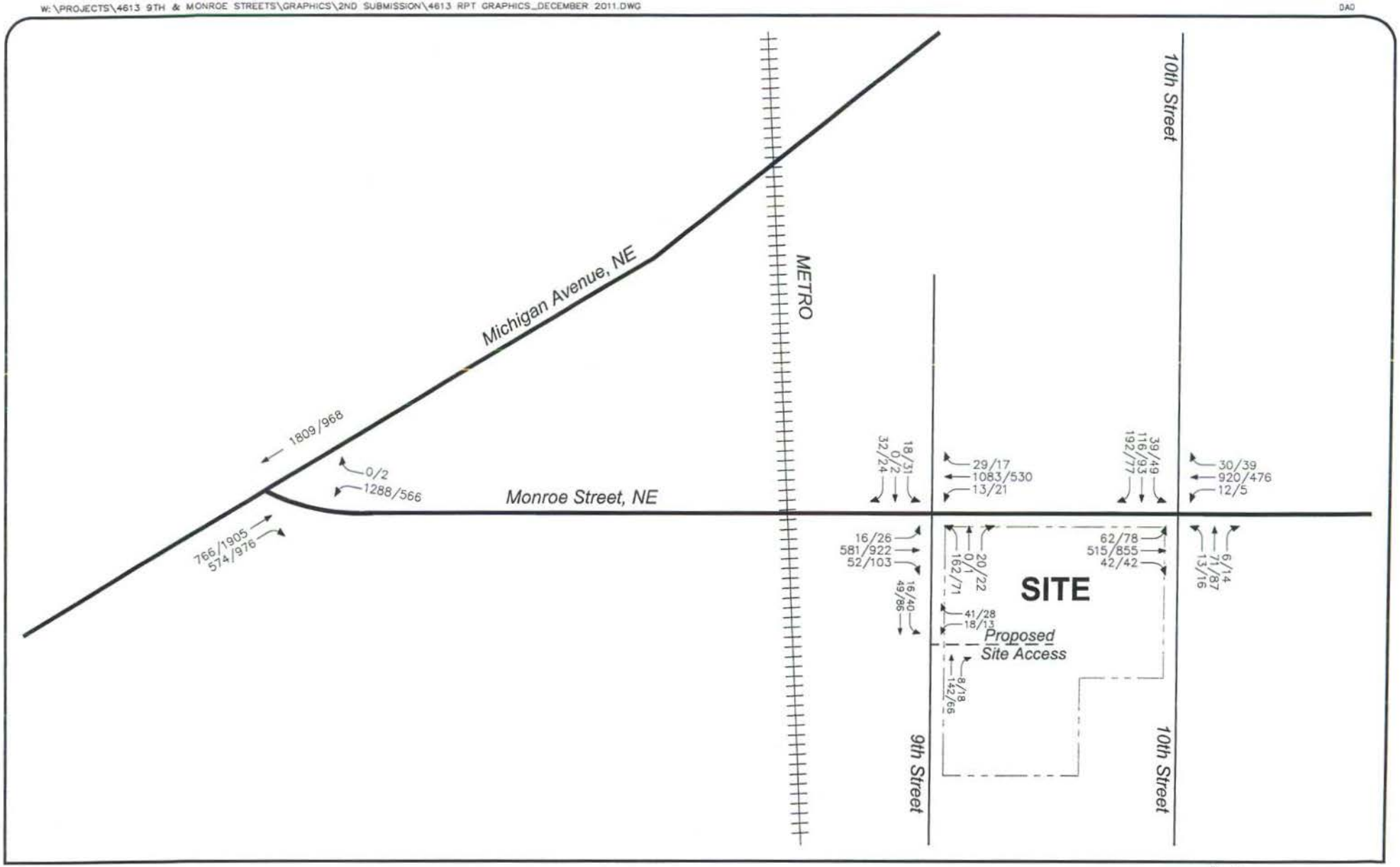

Figure 6–1
2020 Total Future Peak Hour Traffic Forecasts

9th & Monroe Streets, NE
Washington, D.C.

Wells + Associates, Inc.